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THE JOURNAL OF THE DEPARTMENT OF AGRICULTURE OF VICTORIA, AUSTRALIA.

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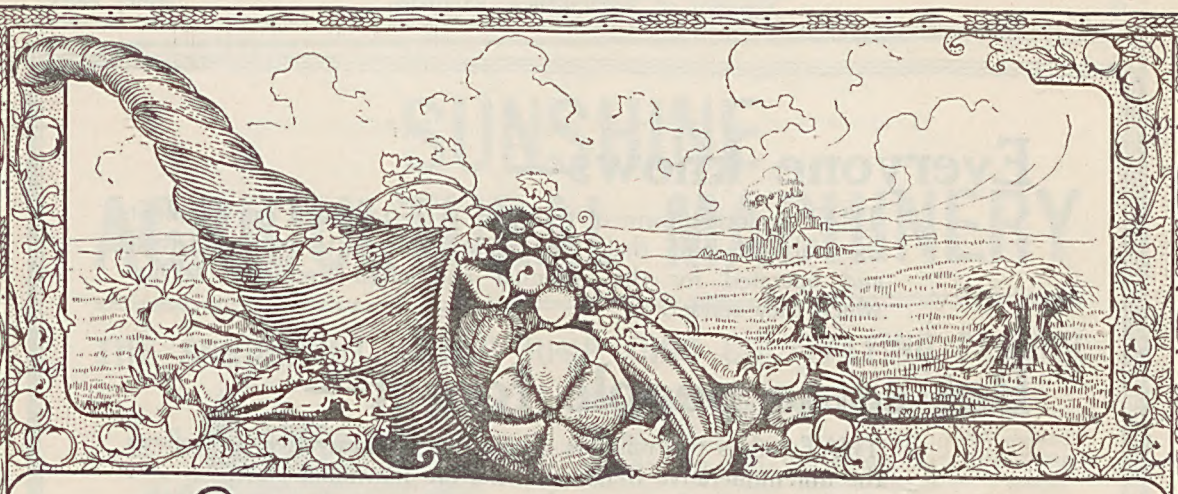

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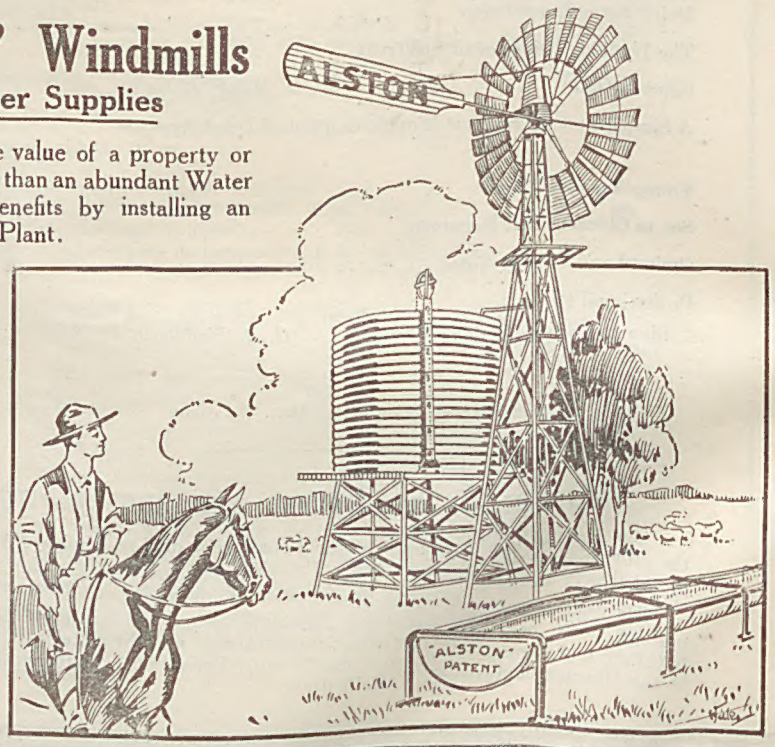

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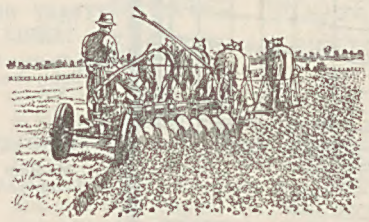

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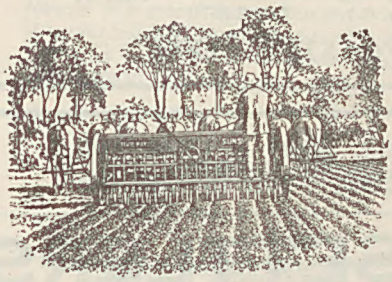

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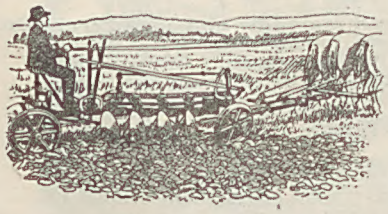

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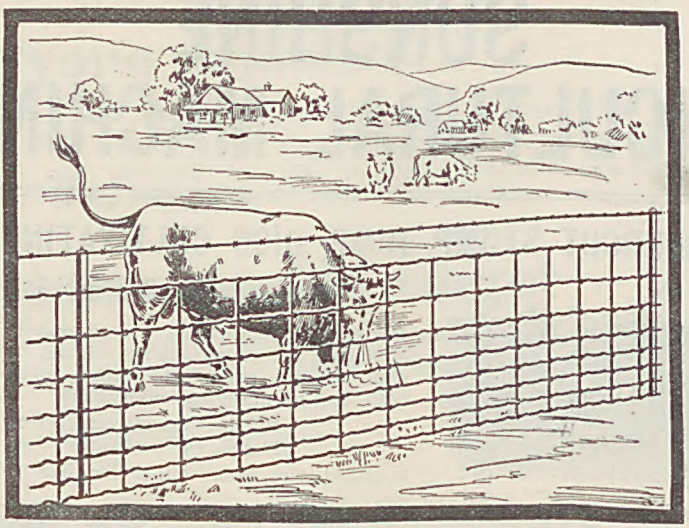

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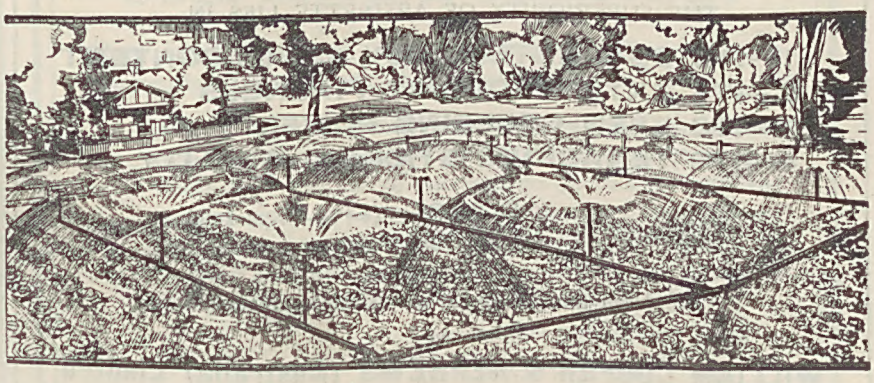

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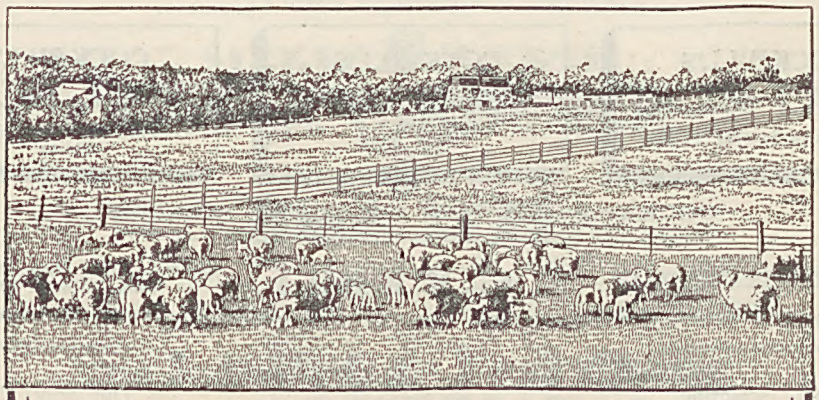

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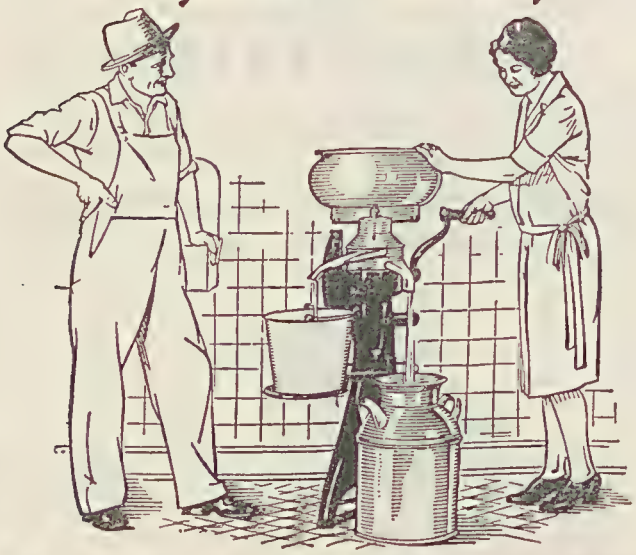

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The Journal of the DEPARTMENT of AGRICULTURE of VICTORIA

The Department of Agriculture

A Review of the Organization and Functions of the Live Stock Division

By Dr. S. S. Cameron, Director of Agriculture

(This article is a continuation of Dr. Cameron's review of the organization and functions of the Department of Agriculture. In the January issue the Head Office administration and Agricultural Division were dealt with, and next month the work of the Horticultural and Produce Divisions will be outlined.)

THE comparatively small space occupied by the live-stock division in the departmental organization chart published last month may mislead as to its relative importance. It is the largest division in point of numbers, and its activities involve the care of the horse, cattle, sheep, and pig industries which together, from the stand-point of production of national wealth, far exceed all other agrarian interests. The division carries out the administration of eight Acts of Parliament; and its statutory duties, therefore, are onerously preponderant over the more agreeable functions of guidance and inspiration. Nevertheless, the contributions of the division to the prosperity of the industries mentioned are manifested by the comparatively low incidence of disease among the farm animals of this State, despite its denser live stock population and heavily-developed stock traffic facilities.

Equally eloquent of solid service is the outstanding position occupied in dairy production, draught-horse breeding, fat-lamb raising, pig and poultry products to all of which our volume of exportable surpluses gives evidence.

Veterinary Services.

The veterinary staff comprises an all too small group of officers engaged on work in which they manage to combine efficient administration of the laws relating to disease control with a reasonable response to the avidity of stock-owners for information and instruction on the breeding, feeding, and rearing of stock.

Comprising now only half a dozen officers, because of the non-filling of vacancies in recent years, and handicapped during the war years by absence on service of all but one, the work of the veterinary staff towards disease suppression has been markedly successful. Diseases which are controllable by quarantine methods have yielded to thoroughness in their application. Anthrax is now so rare as to be almost forgotten. Outbreaks of pleuro-pneumonia and swine fever have become practically negligible compared with the losses a quarter of a century ago. Hygienic teachings have resulted in such diseases as equine influenza and strangles being mere memories. Cripples, coast diseases, impaction paralysis, and the like deficiency diseases of cattle are

Mr. E. A. Kendall, B.V.Sc., Chief Veterinary Inspector.

seldom troublesome nowadays. Milk fever, which used to be almost always fatal, is now subject of simple curative treatment, practically 100 per cent. effective.

Sheep-owners have been taught the means of overcoming "fluke" troubles, and the "braxy-like" sheep disease is within reasonable distance of solution. Contagious abortion and mammitis are still a very real trouble, but when the research workers develop the means for attack, the veterinary field staff may be depended on for thoroughness in application.

In the undertaking of their functions, the veterinary staff has had the indispensable assistance of a small staff of stock inspectors, acting as right hand men in matters of quarantine control and inspection of markets, sales and stock routes. The helpful practical experience and sound knowledge of farm live stock of these officers have always been highly appreciated by stock-owners.

Stock inspectors also undertake the duties imposed by the Sheep Dipping Act and the Shearers Hut Accommodation Act. The former Act provides for the compulsory dipping of all sheep within prescribed periods, and has had a markedly salutary effect in minimizing tick infestation of sheep.

Government Certification of Stallions for Soundness was conceived and initiated by the Victorian Department of Agriculture in 1907, being sponsored by the late Mr. George Swinburne, the then Minister of Agriculture. The system was quickly adopted by the other States and New Zealand, with modifications to meet local conditions. Government certification has now become almost universal, and is provided for by legislation in Great Britain, the United States, Canada, and most other horse-breeding countries. For upwards of ten years the scheme was carried out as a purely administrative act without the support of legislative enactment. The statutory powers under which the scheme is now administered were provided by the Horse Breeding Act passed in 1919.

The Stock Diseases Act is the charter for the action necessary to suppress acute outbreaks of contagious disease and to control or keep within bounds such other diseases of insidious type as tuberculosis. It is a striking tribute to the legislative methods of last century that the provisions of this Act are

An Aerial View of the State Research Farm, Werribee.

so flexible as to have met the requirements of stock diseases control for upwards of half a century without amendment. Under it the present power of quarantine and destruction of animals was provided, and with variation of the powers by regulation which the Act allows of, all emergencies have been met from the days when sheep scab was wiped out during the eighteen-seventies until the extinction of pleuro-pneumonia and swine fever in recent years.

Dairy Supervision.

The Milk and Dairy Supervision Act is the 1928 consolidation of the *Dairy Supervision Act* 1905, the *Dairy Produce Act* 1919, and the *Milk Supply Act* 1923. The former Act also has stood without amendment for 25 years, but its provisions have been supplemented in certain respects by other legislation.

The radical change in dairy and dairy farm control which the Dairy Supervision Act brought about was the substitution of Government departmental control for local municipal control under the Health Act. The Act was not to operate over the whole State at once, but progressively as municipalities were proclaimed. At present 136 out of a total of 196 municipalities (66 per cent.) have been proclaimed. The success of the Act in the respects referred to below has resulted in persistent requests for its State-wide application. Fees paid by dairy-farmers and milk vendors do not meet even half the cost of administration, and it is only the lack of funds that prevents the widespread desire being acceded to.

Another feature of the Act which has proved of great benefit is the supersession of "registration" of dairy farms and dairies by the "license" system. This enables licences to be refused or withheld if the dairy premises or practices are below reasonable hygienic standard. Under this system prosecutions for insanitary surroundings have been reduced to a minimum, the withholding of licences to sell milk being the punitive corrective applied. The Act also gives power to the dairy supervisor for the temporary prohibition for the production of milk for sale of cows affected by any ailment or disease, or suspected of being so affected. The prohibition remains until it is either removed or made permanent after examination by a veterinary inspector. Prohibition of use until skilled examination is possible having thus taken the place of the immediate destruction procedure previously practised under the Stock Diseases Act, has afforded a duly appreciated protection to stock-owners. The Act has also made possible the system of farm to farm instruction and guidance. This method of conveying information has been proved satis-

Live Stock Demonstration by an Officer of the Division.

factory beyond expectation as may be instanced by the following data:—

Production.—Practically similar numbers of cows (632,000 and 636,000 respectively) produced, in 1906, 68,000,000 lb. of butter, and in 1929, 94,000,000 lb., constituting a 38 per cent. increase since the first year of enforcement of the Act. In the quinquennial period, 1907-1911, the average annual production of milk per cow in the State was 280 gallons. In the last five years for which statistics are available (1922-27), the average yield had risen to 355 gallons, being 384 gallons in 1926-27. Still more striking is a comparison between milk yields in supervised and non-supervised areas which, in 1926-27, was as follows:—

Whole State average annual milk yield per dairy cow	384 gallons
Supervised areas average annual milk yield per dairy cow	560 gallons
Non-supervised areas average annual milk yield per dairy cow	250 gallons

Of the six most markedly delinquent factories when the boric acid prohibition was enforced, four were in non-supervised areas, and the remaining two drew considerable quantities of cream from non-supervised areas. Again, out of 52 prizes awarded in competition by the Victorian Factory Managers' Association, 47 went to factories drawing their supplies from supervised districts.

The report of the Federal Dairy Investigation Committee contains the following set of figures, which I take the liberty of quoting without comment:—

STATISTICS FOR YEAR 1928-29.

State.	Recorded Number of Dairy Cows.	Recorded Value of Production.
		£
Victoria	615,000	13,930,000
New South Wales ..	858,000	12,750,000
Queensland	637,000	9,250,000

Disease Suppression.—In 1906-7, the first year of full operation of the Act, 71.8 per cent. of all cases of cows prohibited for tuberculosis were affected in the udder. Seven years later the proportion of udder tuberculosis had been reduced to 6.4 per cent. It is difficult to place a value on the resultant benefit to human life. This reduction was reflected also in the incidence of tuberculosis amongst pigs fed largely on skim milk. During three years, 1910-13, following on five years of administration of the Act, statistical records were collected, and the position disclosed was as shown in the following table:—

TUBERCULOSIS IN PIGS.

Inspection of Carcasses, July, 1910, to June, 1913.

A.—Districts under Dairy Supervision Act.

Place.	Number of Carcasses Inspected.	Number Affected with Tuberculosis.	Percentage Affected.
			%
Ballarat	57,235	1,843	3·22
Geelong	28,067	1,508	5·37
Kilmore	3,402	114	3·35
South Gippsland ..	18,155	1,052	5·79
Totals ..	**106,859**	**4,517**	**4·22**

B.—Districts *not* under Dairy Supervision Act.

Place.	Number of Carcasses Inspected.	Number Affected with Tuberculosis.	Percentage Affected.
			%
Camperdown ..	13,836	2,673	19·33
Colac	40,703	5,659	13·90
Terang	25,329	5,859	23·13
Warrnambool ..	49,216	7,865	15·98
Totals ..	**129,084**	**22,056**	**17·08**

Melbourne Milk Supply.—The Milk Supply Act of 1922 provided for the establishment of a milk laboratory for conducting dairy technological research and bacterial and other purity tests of the whole milk supply. Half the expenditure is borne by the metropolitan municipalities and half by the Government. Arrangement was made with the Melbourne University for the laboratory to be built at the University Veterinary Research Institute, and for the staff of the institute to undertake the work.

During the two years, May, 1926, to June, 1928, a special bacteriological survey of the Melbourne milk supply was undertaken by Dr. H. E. Albiston, Director of Institute, involving 1,283 completed microscopic cultural and biological tests which disclosed only 22 samples, or 1.7 per cent., in which tubercle bacilli were present in any degree. No city in the world where similar investigation has been made shows so low a degree of tubercle infection. The figures for comparable cities in England and America

are as follows:—London, 9.9 per cent.; Manchester, 8.7 per cent.; New York, 11.5 per cent.; Philadelphia, 13.8 per cent. On this evidence, therefore, as regards freedom from living tubercle bacilli, Melbourne milk supply is the most safe of any city in the world. Of such like, in other directions also, is the achievement of the Dairy Supervision staff. It has a record to its credit in the interests of both national wealth and community health of which the successive heads of the division (S. S. Cameron, 1905-10, W. A. N. Robertson, 1911-26, and E. A. Kendall, 1926-31), the Chief Dairy Supervisor (J. M. Kerr), the Senior Supervisors, and the staff generally may well be proud.

The Cattle Compensation Act, passed in 1924, provided for the establishment of a fund by means of a stamp duty paid in respect of all transfers of cattle at the rate of 1d. per pound sterling consideration. From this fund, owners of cattle which die or are destroyed as a result of being diseased, are paid compensation up to seven-eighths of the estimated value of the animal. The knowledge of stock-owners that they are so protected against loss has promoted confidence in reporting the existence of any of the prescribed diseases, and this in turn has facilitated prompt inspection and early suppressive action. The State contributed at first 40 per cent., and now 20 per cent. of the compensation awarded in the case of tuberculosis destruction. Already the benefits of the Act have been reflected in the practically complete suppression of bovine pleuropneumonia in Victoria. It may be safely said that there are no internal *foci* of that disease, such outbreaks as may occur arising from "carrier" animals introduced over the borders in the course of trade. The administration of the Act has involved considerable increase in expenditure in travelling expenses and time of officers, and during last session of Parliament, legislation was passed to enable dairy supervisors to undertake the responsible functions of diagnosis and destruction and valuation of cattle, which functions were previously confined to the veterinary officers and stock inspectors.

Swine Compensation legislation on somewhat similar lines to that for cattle compensation has been in operation since 1927, and its influence has been manifested by the promptness with which outbreaks of swine fever have been localized and suppressed.

Herd Testing.

Government Standard Herd Test.—In 1911 discussions were initiated between the Department and the Jersey Herd Society, which led to the establishment during 1912 of a scheme for the Government certification of pure-bred cows, registered in the herd books of the societies representing all pure breeds, whose milk yields under strict control conditions reached prescribed standards. The fundamental design of the scheme was expressed in the first report in these terms:—"The object desired to be attained is that purchasers of bulls from pedigree herds may be assured concerning the milk and butter yielding capacity of the dams." The Ayrshire herd of Mr. F. J. Stansmore, of Pomberneit, was the first entry made on 4th May, 1912, and although the Gowrie Park herd of the late Mr. W. P. Brisbane gave the Ayrshire breed a good start in the early years, Jersey herds have been preponderant in numbers throughout the whole period.

From the small beginning in 1913, with five herds comprising 62 cows, averaging 220.88 lb. of butter-fat in 273 days, the yearly progress has culminated in 254 herds with 2,500 cows being tested under Government Herd Test conditions this year. The average number of cows per herd under test has remained constant at about ten, but the butter-fat average per herd has increased from 220 lb. in 1913 to 336 lb. in 1929. The highest individual yield in the 1913 test was 388 lb. butter-fat by Mr. Gordon Lyon's Jersey cow "Silvermine IV." In the meantime the application by breeders of the guidance on "weeding, breeding, and feeding" afforded by the test has resulted in many gratifying records, prominent amongst which are the following:—

	Butter-fat. lb.
1915. Department of Agriculture, Red Poll "Muria"	706
1920. J. H. Hunter's Jersey "Rarity 8th of Melrose"	719
1924. Flack and Sewell's Friesian "Dominion Queen Mercedes"	720
1925. Hutchinson and Sons' Jersey "Babs of Somerville"	843
1926. J. Plattfuss's Friesian "Westmere Oakwood Piebe"	726
1927. J. Plattfuss's Friesian "Westmere Oakwood Duchess"	817
1928. Smith and Son's Friesian "Halecote Opera Girl"	762
1930. O. J. Syme's Friesian "Springfield No. 9"	859

Springfield No. 9.—The highest producer in the Government Standard Herd Test.

This Friesian Cow in the 1929-30 Standard Herd Test produced 859 lb. butter-fat.

The strictness of the standard yield for certification by the Government has been consistently maintained throughout. During the last five years 70 per cent. certification has been exceeded only once. The relegating to obscurity of the 30 per cent. of cows rejected annually for certification has been a material factor in attaining the forefront position occupied by Victorian pedigree herds of the dairy breeds. Consequently the supply and distribution of high grade "production-bred" bulls has kept pace with the ever increasing demand for such bulls by owners of commercial herds whose progressively increasing yields have accounted for Victoria's foremost position in dairy production value as shown in the statistics quoted on a preceding page.

The cost of conducting the herd testing exceeds £6,000 per annum. Fees paid at the rate of £1 per head and 5s. per cow by returned soldier owners, and £2 per herd and 10s. per cow by all other owners, amount to approximately £1,600, the net cost to the Government being therefore approximately £4,400. No subsidy or grant is received from the Commonwealth in respect of pure-bred herd testing.

Grade Herd Testing.—Although many progressive dairymen were testing their herds in a more or less spasmodic way a quarter of a century ago, the early efforts to establish grade herd testing associations—at Bloomfield in 1913, and later at Foster, Leongatha, and Ballendalla—were unsuccessful.

The testing of commercial herds is a natural corollary of pure-breed herd testing, and it was part of the original design when the Standard Herd Test was inaugurated to follow on with Grade Herd Testing when the pedigree herd test had proceeded sufficiently to ensure an adequate supply of test-bred bulls for use in the grade herds under test. In the second annual report of the Standard Herd Test, the matter was referred to in the following terms:—

"It has been said that the Standard Herd Test is beginning at the wrong end of the business, and that the general herd test should come first. The importance of the general herd test is recognized, the object being to discover which cows are capable of giving profitable returns when properly fed and treated in order that heifers from these may be reared to take the place of those culled. Unless these heifers are by a bull known to be bred from a heavy butter-producing family there is no certainty that they will be any better than those already in the herd. Dairy farmers should be in a position to obtain reliable information as to where bulls that might be depended on to work improvement in the herd can be purchased at a reasonable figure, and the Government Herd Test is designed to afford that information."

The first successful organization was established at Yinnar, in Gippsland, in 1919, largely through the powerful advocacy of Mr. W. J. Yuill, then District Dairy Supervisor, who managed to enthuse a sufficient number of dairy-farmers, and who, ably helped by Mr. Gill, Senior Herd Tester, and other sincerely enthusiastic officers, has since been the life and soul of the movement which

consummated in the establishment in September, 1925, of the Victorian United Cow Testing Association. In the meantime seven other associations had been started in Gippsland, and, with the progress being made by the Standard Herd Test, the time appeared ripe for the Government to give a vitalizing influence to the struggling movement by affording it financial assistance. Accordingly, in June, 1924, the Government decided to make available £5,000 for subsidization of district associations organized under rules framed by the Department. Conditions governing the granting of subsidies included obligations to cull the proven inferior cows and the use of an annually progressive percentage of Standard Herd Test bred bulls by members of the association.

The early tours of the Better Farming Train through dairying districts in 1915 afforded opportunity for advocacy of the movement, and with subsidies available many new associations were formed and welded into the United Cow Testing Association which to-day comprises 134 district associations, having under test 3,133 herds and 95,408 cows. The average annual production of these grade-test cows in 1929 was 222.37 lb. of butter-fat, having a value of £18 15s. 3d. per cow. This is an increase of 66 lb. per head over the 156 lb. per head for all cows in the State, and represents an increase of production value per head of £5 12s. 9d., which for the 95,408 cows now under test comes to a total sum of £537,800 per annum—a magnificent tangible return for the £24,000 which is approximately the annual cost of grade herd testing contributed equally by the dairy-farmers concerned and the State and Commonwealth Governments.

In 1926 further stimulus was given to the organization by a Commonwealth grant to the States on a basis of £1 for £1 of the State's expenditure. In Victoria this has risen to upwards of £8,000 per annum, so that supplementary to membership fees the community is contributing £16,000 per annum towards this form of aid to the materialization of the £14,000,000 sterling which is the recorded value of dairy production in Victoria.

The Better Bull Scheme.—Closely linked with the Herd Test movement is the bull purchase subsidy scheme which was inaugurated in Victoria in 1927. This is a twice-blessed plan. It blesses pedigree breeders who sell, giving them a ready market for all surplus male progeny, and it blesses the dairy-farmers who buy, enabling them to obtain a production-bred bull on easy terms and at less than half its value. The Government contributes one-half the cost, and allows to approved farmers extended terms for payment of the other half.

In 1929-30 purchases cost the Department £5,993, of which £2,996 is to be recouped, but on account of the financial stringency only

Dot—Highest Producing Grade Cow in Victoria.

(Owned by Messrs. Moore & Co., Tooloonook, Gippsland.)

Milk, 14,635 lb.; Test, 5·66; Butter-fat, 829·4 lb. Yielded 90 lb. butter-fat in the last sub-period and averaged over 3 lb. butter-fat daily for nine months.

£1,500 could be provided for the current financial year. This has been already expended, and the scheme is practically suspended until better times return. Bulls of the recognized pure dairy breeds only are accepted, and they must be *ex* dams having a Government Standard Test certificate. Altogether 790 young bulls have been distributed under the scheme up to the present.

The Pig Industry is a valuable adjunct to dairying and mixed farming operations. Its development in Australia to a wealth-producing importance proportionate to allied farm products has been retarded because of inability to establish so easily an export trade whereby surplus production could be disposed of. As concerns local consumption, pig products are peculiarly liable to gluts and periods of scarcity. On the latter occurring pigs are multiplied rapidly, and in a short time boom production produces a glut unless price levels in England are such as to make export profitable.

During the past year this has been the case, but for a number of years previously Australian pig products could not compete on the English market against those from European countries.

Under these circumstances the Department has found it difficult to press a forward policy. Nevertheless, the active efforts of Mr. R. T. Archer, the late Senior Dairy Inspector, and Messrs. Gill, Yuill, and Baker towards promoting rational breeding, feeding, and management methods, have been highly successful. With the co-operation of enthusiastic stud-breeders the farming end of the industry is in a position to meet overseas requirements as regards quality, weights, and adequacy of economical supplies.

The Administration of the Live Stock Division was in the able hands of Dr. W. A. N. Robertson as Chief Veterinary Inspector from 1911 to 1926, when he resigned to take his present post of Director of Veterinary Hygiene in the Commonwealth Health Department. Apart from the success he achieved in the Victorian Department, Dr. Robertson's conspicuous ability was manifested in his control and eradication of rinderpest when that dire disease gained a footing in Western Australia in 1923, the Commonwealth Government having requisitioned his services to control quarantine procedure.

Colonel E. A. Kendall, B.V.Sc., D.S.O., C.M.G., succeeded to the position of Chief Veterinary Inspector and head of the division, and has been assiduous in carrying on and developing the activities of that division. It is unfortunate that his term of office so far has been coincident with a period of retrenchment in departmental expenditure, and retardation of progress has been avoided only by a self-sacrificing imposition on himself of added endeavour and by the loyal co-operation of the staff in the adjustment of duties which have been deemed necessary. Both Dr. Robertson and Mr. Kendall will join with me in tribute to the valuable assistance received throughout from Mr. R. N. Johnstone, Assistant Chief Veterinary Inspector; Mr. R. Griffin, Senior Veterinary Officer; Mr. J. M. Kerr, Chief Dairy Supervisor; Mr. J. Marshall, Stock Inspector; Mr. A. J. Gill, Senior Herd Tester; Mr. W. J. Yuill, Senior Dairy Supervisor, and other leading officers, as well as from the rank and file of the staff.

Reducing Production Costs

Adjusting Fertilizer Costs to Slump Prices for Wheat

By H. A. MULLETT, B.Agr.Sc., Agricultural Superintendent.

Manurial Plots, Longerenong Agricultural College.

AT the present time wheat in Australia is being sold at lower price levels than for 35 years, and the price would be even lower but for an overseas exchange premium of no less than 6d. a bushel.

Values are so low that costs normally regarded as incidentals have assumed a relatively important proportion of the returns received. For example, with wheat at 2s. 3d. a bushel on trucks at Williamstown, out of every 100 bags grown approximately fifteen are required to pay freight to Melbourne and twelve are necessary to meet the cost of the bags used. Thus 27 bags out of 100 are required to pay for these two items alone. Naturally wheat-growers are at their wits' ends to carry on under these conditions, especially as in a number of districts they coincide with a year of low yields and a rain-damaged harvest. This crop failure, following on the previous year's drought, has shaken the judgment of some, and here and there there is a tendency to look for some scapegoat among the various farm practices. To particularize, because in some districts there are crops on fallow not so good as those on stubbles, it is being urged that fallowing is unnecessary; and elsewhere, where manuring is universal and crop failures general, blame is placed upon the manure.

But the truth is that factors other than these are entirely responsible, and it would be a pity if practices tried and proved over many years were deprecated through misunderstanding. The causes of crop failure this year over such a wide area in the lower Mallee and portions of the northern Wimmera are clearly apparent. The crop was sown on a seed-bed devoid of any moisture reserves whatsoever in the subsoil, but liberally stocked with plant food by reason of its enforced rest the previous year. Watered by timely rains —at no time more than sufficient for current needs—the wheat grew luxuriantly.

June was a dry month with many frosts; this set the wheat back somewhat, but it thrived during August, so much so that by the end of that month it was remarked everywhere that never were the crops more promising. Since there were no sub-soil

moisture reserves, such a well-grown crop, with its big leaf surface making heavy demands upon the soil moisture, was a potential source of danger as the warmer weather set in. Nowhere was the soil moist for much more than a foot deep. September passed practically without rain, persistent drying winds eventually wilted the plants, and the crops on hundreds of thousands of acres of the heavier soils looked to all intents and purposes dead.

Rain came on 11th October, and heavy falls occurred in regular sequence almost every week for a lengthy period. The crops revived in a manner that surprised even the most optimistic. In an amazingly short time the fields were green again. The original tillering had been heavily reduced in numbers, but in most plants one or two of the earliest shoots matured and formed grain. Numerous secondary tillers made their appearance, and within two months of the rain they had headed. For the most part the heads were small and sappy, and a fortnight's dry weather, aided by one good frost and every conceivable disease, finished them off. Grain formed, but it pinched badly. Not a few people were inclined to the view that a new disease was responsible for the failure of the secondary growth, but none was found, those present being foot-rot, take-all, flag-smut, septoria, and rust—all common diseases. It was obvious that the drought-weakened secondary growth was especially susceptible to attack by diseases under the weather conditions following the dry spell, for in a number of cases on patches of soil where an early irrigation had occurred, as, for example, accidental overflow of dams and channels, perfectly healthy crops were grown. In some of the later districts in the Wimmera a frost at flowering time reduced yields by as much as 30 per cent.

An examination of the results of the various departmental fields in and around this area affords no justification whatever for the view that had the amount of fertilizer applied been substantially reduced the failure could have been avoided. The crops failed despite the employment of the best farming practice, and not because of it. The conditions were such that every kind of farming practice, good and bad, failed to give results. Wise after the event, we now know that we could have saved ourselves a lot of trouble and expense had we known a year ago and earlier what we know to-day. Because of that failure to forecast the weather last year, are we justified in trying to forecast it this year? That is what the adoption of scratch methods amounts to.

How Much Super.?

The present emergency is no time to rashly jettison sound principles and proved practices, but rather to modify them rationally in conformity with the altered economic situation. Undoubtedly there should be some modification of methods, and these can be deduced by a study of the relevant data and various costs calculated at the new price levels. For example, the present is obviously a time for a close review of the quantity of superphosphate to employ for the greatest profit. In a number of districts it will be found that some reduction in the quantity used with wheat is warranted, but in others that is not the case. This reduction has nothing to do with theories about the "burning off of crops," &c., but is the result of the simple business calculation illustrated below.

The object of applying manure is to make a profit on the transaction, and just so much should be applied to each acre as gives the maximum extra return after paying for the cost of the fertilizer landed on the farm out of the net return for the increased crop produced, i.e., value of increased crop less charges for bags, freight, &c. When wheat has a low value relative to the cost of the fertilizer it pays to use less of it than when wheat has a high value relative to the cost of the fertilizer.

Because of the comparatively steady price levels at which wheat has maintained itself for a long period, attention has rarely been directed to the point, and consequently apparently it is imperfectly understood—at all events, that is the writer's impression after drawing attention to it at the Mallee Farmers' Convention at Ouyen in 1928.

Examination of almost any set of results of carefully conducted fertilizer experiments in which a series of amounts of fertilizer in steadily increasing order of magnitude have been applied to a series of plots will show that the increase obtained from the smallest application of fertilizer is not proportionately maintained with additional moieties. For example, as the result of nineteen years' tests

with wheat at Longerenong the following results have been obtained:—

—	Yield per Acre.	Increase Over No Manure.
	Bushels.	Bushels.
No manure	31·6	..
Super., ½ cwt. per acre ..	35·2	3·6
Super., 1 cwt. per acre ..	36·5	4·9
Super., 2 cwt. per acre ..	37·9	6·3

Thus the first ½ cwt. of super. per acre produces an increase of 3.6 bushels, and had this ratio been maintained 1 cwt. should produce an increase of 7.2 bushels an acre, but, in fact, it is 4.9; and 2 cwt. should have produced an increase of 14.4 bushels an acre, whereas, in fact, it is only 6.3. From these considerations it is obvious that whereas with each successive dose the cost of the fertilizer advances steadily in direct proportion to the amount applied, the return from extra wheat grown advances much more slowly. Hence a point is soon reached, especially when wheat is relatively low in price, when further increases in fertilizer beyond a definite limit not only do not produce enough increased wheat to pay for the fertilizer used, but result in a direct loss to the user.

Table 1 illustrates the position in regard to the growth of wheat on black soils similar to those on the Horsham plains at Longerenong College. The returns have been calculated assuming wheat at 1s. 6d., 2s., and 4s. 6d. a bushel net to the farmer, the 4s. 6d. being included for the sake of comparison with normal prices. Super. has been charged at the cost price Melbourne, plus freight to the country centre. From these figures farmers in the district may readily ascertain the amount they should apply to obtain the greatest return to themselves, making the necessary adjustments where interest on the cost of manure and any other extra charges apply.

The table shows that when the net return to the farmer for wheat was 4s. 6d. per bushel it paid to use as much as 2 cwt. per acre on well-worked fallow in that district; the extra return was 1s. 4d. an acre greater than where 1 cwt. was used, and 4s. 9½d. per acre greater than where ½ cwt. was used. With wheat at 1s. 6d. net to the grower 2 cwt. of fertilizer per acre, costing 9s. 10d. per acre, produced extra wheat valued at 9s. 5d. per acre; hence the result of the use of such an application is a loss of 5d. an acre. The use of 1 cwt. is responsible for an extra return of 2s. 5d. per acre after paying for the fertilizer out of the extra wheat produced; on the other hand, ½ cwt. of super. gives a net extra return of 2s. 11½d., i.e., the greatest net return of any dressing, whereas when wheat was 4s. 6d. net this amount of fertilizer gives the lowest return. With wheat at 2s. net to the grower, the use of 1 cwt. to the acre gives the most profitable return.

Of course, the residues of the fertilizer are of considerable value to the oat crop following wheat, or to the volunteer pasture if the land remains in such. These residues are difficult to evaluate, but it is known that they are substantial and persistent in the case of superphosphate, the universal manure for wheat. Tests at Werribee have shown

LONGERENONG.

TABLE I.—SHOWING WITH VARYING PRICES OF WHEAT, AVERAGE INCREASED RETURNS DUE TO APPLICATION OF SUPERPHOSPHATE.

—	Average Yield 19 Years, 1912–30.	Increase Due to Fertilizer.	Cost of Fertilizer* per Acre.	Value of Increased Wheat at—			Extra Return per Acre due to Fertilizer with Wheat at—		
				4s. 6d. a Bushel.	2s. a Bushel.	1s. 6d. a Bushel.	4s. 6d. a Bushel.	2s. a Bushel.	1s. 6d. a Bushel.
	Bushels per Acre.	Bushels per Acre.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
No manure ..	31·6	..	..	..	..	..	..	..	..
Super., ½ cwt. ..	35·2	3·6	2 5½	16 2	7 2	5 5	13 8½	4 8½	2 11½
Super., 1 cwt. ..	36·5	4·9	4 11	22 1	9 10	7 4	17 2	4 11	2 5
Super., 2 cwt. ..	37·9	6·3	9 10	28 4	12 7	9 5	18 6	2 9	0 5†

* Cost of fertilizer at Longerenong, £4 18s. 2d. per ton. † Loss.

increases in the first year due to the residual effect of 56 lb. of super. on wheat to range from 40 to 50 per cent., and at Rutherglen 50 per cent.; and at Werribee for 1 cwt. of super. from 46 to 200 per cent., and at Rutherglen 100 per cent. What they are for pasture is not known, but it is safe to say from general experience that the residues from 56 lb. of super. per acre on the average add 50 per cent. in the first year to pasture, and that 1 cwt. adds 70 to 80 per cent. The stock-owner can calculate the value of these residues as applying to their own individual circumstances.

Tables 2 and 3 set out similar calculations for all centres where departmental manurial experiments with wheat are conducted, viz.:—Carwarp, Walpeup, Rainbow, Salisbury, Waaia, Shepparton, Willaura, Werribee, and Rutherglen. From them can be ascertained for various prices of wheat whether the customary manurial dressing should be decreased or not.

The results show that in districts similar to Carwarp (sandy red loam), Rainbow (red sandy loam), Salisbury (black soil), Longerenong (black soil), Rutherglen (grey clay loam), farmers should closely examine the business aspect of the return being obtained from the present quantities of superphosphate being used for wheat, and if the amounts recommended by the Department are being used they could profitably be reduced so long as wheat does not return more than 2s. net to the grower on the farm. On the other hand, in districts similar to Walpeup (red sandy loam), Waaia (red clay loam), Shepparton (grey loam and red loam), Willaura (grey clay loam) and Werribee (red loam), where the response to superphosphate is above the average, no reduction below the amount usually advocated by the Department is desirable; and as there are a number in these districts who are not using the amount recommended it should pay them to increase the dressing to this amount.

In determining the amount to apply for the following year, the wheat-grower has to assume a definite figure for the price. What that figure may be no one can be sure, but it is safe to assume that it will be substantially below the levels ruling for the past few years.

TABLE II.—GROUP OF DISTRICTS IN WHICH THE QUESTION OF REDUCING THE AMOUNT OF SUPER. USED IS WORTH INVESTIGATING.

Manure per Acre.	Average Yield.	Increase due to Fertilizer.	Cost of Fertilizer per Acre.	Value of Increased Wheat at—			Extra Return per Acre due to Fertilizer with Wheat at—		
				4s. 6d. a Bushel.	2s. a Bushel.	1s. 6d. a Bushel.	4s. 6d. a Bushel.	2s. a Bushel.	1s. 6d. a Bushel.
	Bushels per Acre.	Bushels per Acre.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
CARWARP (14 years' results).									
No manure ..	9·8	..	..	..	..	..	..	..	..
Super., 30 lb. ..	12·1	2·3	1 4	10 4	4 7	3 5	9 0	3 3	2 1
„ 60 „ ..	12·7	2·9	2 8	13 1	5 10	4 4	10 5	3 2	1 8
„ 90 „ ..	13·3	3·5	4 0	15 9	7 0	5 3	11 9	3 0	1 3
RAINBOW (4 years' results).									
No manure ..	6·5	..	..	..	..	..	..	..	..
Super., ½ cwt. ..	8·0	1·5	2 6	6 9	3 0	2 3	4 3	+ 0 6	— 0 3
„ 1 „ ..	9·2	2·7	5 0	12 2	5 5	4 1	7 2	+ 0 5	— 0 11
„ 1½ „ ..	9·2	2·7	7 6	12 2	5 5	4 1	4 8	— 2 1	— 3 5
SALISBURY (11 years' results).									
No manure ..	31·2	..	..	..	..	..	..	..	..
Super., ½ cwt. ..	33·8	2·6	2 6	11 8	5 2	3 11	9 2	+ 2 8	+ 1 5
„ 1 „ ..	33·8	2·6	5 0	11 8	5 2	3 11	6 8	+ 0 2	— 1 1
„ 1½ „ ..	34·1	2·9	7 6	13 1	5 10	4 4	5 7	— 1 8	— 3 2
„ 2 „ ..	33·6	2·4	10 0	10 10	4 10	3 7	0 10	— 5 2	— 6 5
RUTHERGLEN (15 years' results).									
No manure ..	12·0	..	..	..	..	..	..	..	..
Super., ½ cwt. ..	20·3	8·3	2 5	37 4	16 7	12 5	34 11	14 2	10 0
„ 1 „ ..	21·4	9·4	4 10	42 4	18 10	14 1	37 6	14 0	9 3
„ 2 „ ..	22·7	10·7	9 8	48 2	21 5	16 1	38 6	11 9	6 5

NOTE.—Cost of Super. at Carwarp, £5 1s. 5d.; Rainbow, £5 0s. 2d.; Salisbury, £4 19s. 8d.; Rutherglen, £4 17s. 6d per ton.

TABLE III.—GROUP OF DISTRICTS WHERE HEAVIER DRESSINGS OF SUPER. ARE STILL PROFITABLE.

Manure per Acre.	Average Yield.	Increase due to Fertilizer.	Cost of Fertilizer per Acre.	Value of Increased Wheat at—			Extra Return per Acre due to Fertilizer with Wheat at—		
				4s. 6d. a Bushel.	2s. a Bushel.	1s. 6d. a Bushel.	4s. 6d. a Bushel.	2s. a Bushel.	1s. 6d. a Bushel.
	Bushels per Acre.	Bushels per Acre.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
WALPEUP (6 years' results).									
No manure ..	12·6	..	..	..	..	..	..	..	..
Super., 30 lb. ..	15·3	2·7	1 4	12 2	5 5	4 1	10 10	4 1	2 9
„ 60 „ ..	16·6	4·0	2 8	18 0	8 0	6 0	15 4	5 4	3 4
„ 90 „ ..	17·7	5·1	4 0	22 11	10 2	7 8	18 11	6 2	3 8
„ 120 „ ..	17·6	5·0	5 4	22 6	10 0	7 6	17 2	4 8	2 2
WAAIA (5 years' results).									
No manure ..	10·0	..	..	..	..	..	..	..	..
Super., ½ cwt. ..	12·0	2·0	2 5	9 0	4 0	3 0	6 7	1 7	+ 0 7
„ 1 „ ..	14·5	4·5	4 10	20 3	9 0	6 9	15 5	4 2	+ 1 11
„ 1½ „ ..	15·5	5·5	7 3	24 9	11 0	8 3	17 6	3 9	+ 1 0
„ 2 „ ..	15·9	5·9	9 8	26 7	11 10	8 10	16 11	2 2	− 0 10
„ 2½ „ ..	16·7	6·7	12 1	30 2	13 5	10 1	18 1	1 4	− 2 0
SHEPPARTON (7 years' results).									
No manure ..	15·4	..	..	..	..	..	..	..	..
Super., ½ cwt. ..	18·8	3·4	2 5	15 4	6 10	5 1	12 11	4 5	+ 2 8
„ 1 „ ..	20·7	5·3	4 10	23 10	10 7	7 11	19 0	5 9	+ 3 1
„ 1½ „ ..	20·8	5·4	7 3	24 4	10 10	8 1	17 1	3 7	+ 0 10
„ 2 „ ..	21·7	6·3	9 8	28 4	12 7	9 5	18 8	2 11	− 0 3
„ 2½ „ ..	22·0	6·6	12 1	29 8	13 2	9 11	17 7	1 1	− 2 2
WILLAURA (5 years' results).									
No manure ..	21·4	..	..	..	..	..	..	..	..
Super., 1 cwt. ..	31·7	10·3	4 10	46 4	20 7	15 5	41 6	15 9	10 7
„ 1½ „ ..	34·1	12·7	7 3	57 2	25 5	19 1	49 11	18 2	11 10
„ 2 „ ..	32·4	11·0	9 8	49 6	22 0	16 6	39 10	12 4	6 10
WERRIBEE (16 years' results).									
No manure ..	6·4	..	..	..	..	..	..	..	..
Super., ½ cwt. ..	14·0	7·6	2 4	34 2	15 2	11 5	31 10	12 10	9 1
„ 1 „ ..	16·9	10·5	4 8	47 3	21 0	15 9	42 7	16 4	11 1
„ 1½ „ ..	19·0	12·6	7 0	56 8	25 2	18 11	49 8	18 2	11 11
„ 2 „ ..	19·3	12·9	9 4	58 1	25 10	19 4	48 9	16 6	10 0

NOTE.—Cost of Super. at Walpeup, £5 1s. 2d.; Waaia, £4 16s. 8d.; Shepparton, £4 16s. 4d.; Willaura, £4 17s.; and Werribee, £4 12s. 3d. per ton.

Irrigated Pastures

Establishment and Management Hints.

By L. C. Bartels, B.Agr.Sc., Senior Irrigation Officer.

DURING the last few years the extension of mixed pastures has been a notable development in the irrigated districts of Victoria. This, of course, suggests that their suitability and worth have been proved, but it indicates also that good farming methods are in operation, because success with seeded pastures means that attention is being given to such factors as top-dressing, careful irrigation, and grazing management.

It is generally conceded that the teaching of the Department of Agriculture has been responsible for this spread of irrigated pastures, and the experiments at the Werribee Research Farm provide the basis for that teaching. Seventeen years ago mixtures of grasses and clovers were sown in certain paddocks at Werribee, and the pastures which resulted have been under observation over that period. They have improved with age, and much larger areas have since been sown. The experience at Werribee has demonstrated the high carrying capacity of these pastures. Owing to their mixed composition they provide variety in the feed, and because of the different seasonal growth of the various species in the mixture give good grazing throughout the year. Good pastures, it has been shown, provide the cheapest form of maintenance for farm animals.

These facts are well established, and the majority of dairy-farmers in irrigation districts are no longer seeking information as to the value of irrigated mixed pastures. What they want to know is: How are mixed pastures established and maintained, and how are they to be managed to get best returns?

The careful preparation of the land is of the utmost importance and bears on the subsequent management. A good seed-bed is desirable to secure proper germination of the seed, and to free the land from weeds which may smother the seedling grasses. It is often argued that land on an irrigation farm is too valuable to be left in bare fallow, but the experienced farmer knows that if he ploughs his land a few months before the intended sowing time and cultivates to keep the surface loose and free from weeds, he is almost assured of a successful start. He can sow at the most opportune time, and even under unfavorable seasonal conditions, will rarely have a failure.

The development of irrigated pasture depends on the proper distribution of water and the value of careful grading of the land and check-banking should be obvious. Too often one sees evidence of "hurry-up" methods—cloddy soil surface, unevenness showing bumps which will not be covered by irrigation water, depressions where water will lie, and loose, lumpy check-banks which remain bare of herbage. Of course, this surface condition means that the seed-bed is uncompacted, and a very poor strike usually results.

Extended preparations of the soil means that it can be reduced to a workable condition; there is time for repeated attention to grading; loose filling scraped into hollows will sink, and more levelling must be done. To the objection that this means time and money, one may point out that these pastures are destined to be permanent. Proper grading is a permanent improvement, and the man who pays attention to the careful preparation of his land for irrigated pastures is repaid over and over again by the uniformity of growth, extra return, and greater facility of irrigation.

A mixture of grasses and clovers which has proved suitable for the irrigated districts of Victoria is as follows:—

Perennial rye-grass (New Zealand or Victorian old pasture seed) ..	10	lb.	per acre.
Italian rye-grass	3	„	„
Cocksfoot	5	„	„
Perennial red clover (New Zealand seed)	2	„	„
White clover	1	„	„
Alsike clover	1	„	„
Subterranean clover	1	„	„
Strawberry clover	½	„	„
Lucerne	1	„	„

All of the plants mentioned have been introduced. In the cooler and moister districts of the State they grow naturally, as the splendid pastures of rye-grass and white clover in parts of Gippsland, for example, give evidence, but in the irrigation districts they are sustained only by due attention to watering and manuring.

Pastures improve with age, because there comes about a natural selection and propagation of the strains best suited to a particular environment. A good illustration of this is to be seen on the spread of white clover in the irrigation districts. There are wonderful pastures of white clover spreading naturally in the Werribee, Maffra, Tongala, and Rochester districts, and of rye-grass and white clover and strawberry clover at Cohuna, while strawberry clover is spreading on the Swan Hill flats.

Grasses and clovers may be sown in autumn or spring. In the northern districts autumn sowing is preferable. Sowing with manure is a good practice, and up to 2 cwt. per acre may be used with advantage. The seed may be mixed with the manure just before sowing and the mixture sown through the manure run of the drill. If the drill tubes are allowed to hang free the seed will not go in too deeply, and a chain looped and trailed behind the drill usually will cover the seed.

The clover seedlings are tiny and delicate; aggressive weeds will smother them, and there is a danger of the rye grasses shutting out the light if allowed to grow too tall. Even as small a seeding as 3 lb. of Italian rye-grass may cause trouble, and for this reason also. cover crops are not recommended. A rapid grazing off with sheep or mowing usually will improve matters.

Friesians on a Productive Permanent Pasture at Leitchville.

Inspecting Irrigated Pasture at Cohuna.

Rates and Frequencies of Watering.

Regular watering and liberal manuring are essential for the maintenance of good irrigated pastures. Of the mixture mentioned above, lucerne is the only plant which would persist in the northern districts without irrigation water, although, of course, it would not be so productive as if irrigated. There are irrigation farmers who favour lucerne by itself before mixed pasture, and their main objection to the pastures is that they are too exacting in regard to moisture. Lucerne certainly will live under much drier conditions than will the grasses and clovers recommended, but the Werribee experiments would suggest that for best results from either lucerne or mixed pasture the water requirements are about the same, and that 2 feet of water during a normal season is the optimum amount in both cases. Grasses and clovers will flourish under moister conditions than will lucerne, but they do not like excess water, particularly if they are subjected to long spells of dryness between waterings. Regularity in watering is the main consideration with pastures, although they will withstand wet conditions better than lucerne. This, however, is no warrant for the excessive use of water. Interesting experiments are being conducted at Werribee in regard to the effects of varied rates and frequencies of watering on pastures. There are several plots in the series all watered differently. All were sown with the same mixture, and have received the same manurial treatment. One plot gets no irrigation water; the others receive from 18 inches to 36 inches in the season. Production is determined by mowing

the grass at the grazing stage, and considerable differences have been disclosed. Under the varied watering systems the pasture on the plots is assuming different conditions.

If farmers could see these plots they would understand that the character of their pasture depends less on the soil and the mixture sown than on themselves and their irrigation methods. The complaint often heard that subterranean clover has taken charge, or that white clover will not grow, would perhaps become resolved into an appreciation of subterranean clover which grows and produces well with few waterings. There are districts in the State where water cannot be made available for fortnightly or three-weekly irrigations. These are the places where lucerne, subterranean clover, and Wimmea rye-grass should be sown. Where 18 inches of water is put on in the season, there is a very big difference in the results if it is divided into six waterings from what is obtained if it is given in three 6-inch waterings. Six waterings maintain fairly even conditions. Rye-grass, cocksfoot, subterranean clover, and white clover show in a fairly well-balanced mixture, but with three waterings only the conditions are irregular, and so subterranean clover, trefoil, and the lesser annual clovers are the main constituents of the pasture.

The tight soils of the Goulburn Valley will not take water readily, and it is difficult to get even a 3-inch watering into the ground. In such cases close attention to watering is imperative. In some districts water has been available at ten-day intervals, and steady growth has been maintained by frequent irrigations, but this is not always practicable, and the suggestion is made that where soils do not absorb water easily, supplementary waterings will give good results. By this is meant that, when a paddock of pasture is irrigated and has taken only 2 or 3 inches, it will be greatly benefited if another watering is given after one or two days. This can be done efficiently with a smaller stream. Four-inch waterings at three-weekly intervals should be the objective.

Top-Dressing.

Top-dressing is all important for the maintenance of good irrigated pastures, and the Werribee manurial trials have shown that 4 cwt. of super. per acre may be profitably applied as an annual dressing. The yields from the manurial test plots were determined for the 1929-30 season by mowing the grass at approximately three-weekly intervals, and the most striking fact in connexion with the tests was that the plot receiving an annual dressing of 4 cwt. of super. yielded 32 tons of green herbage per acre. Systematic analyses were made of samples of these clippings, and a very high protein and mineral content of the herbage in the young stage was shown. The production from the manured plot was more than double that from an unmanured plot adjoining.

Utilizing All the Grass.

These tests have given us a measure of the productivity of irrigated pasture, but it will be said that the ultimate test of the production of a pasture is the carrying capacity or the milk obtained from it. This brings us to the next phase of pasture management—the effective utilization of the pasture.

It may be asserted that on irrigation farms we get the best exemplification of the value of the latest teachings in grazing management, i.e., of grazing hard, and allowing only a sufficient period of recovery for the development of 3 or 4 inches of growth. On the average irrigated block there is no feed to waste. Pastures are "punished," and because most farmers have, as yet, only limited areas of seeded-pasture available, these small areas are heavily stocked. More than anything else, this has brought home to farmers the value of the pastures. Careful farmers who record the milk obtained when cows are on different paddocks have been agreeably surprised when the production from these pastures has been tabulated. Farmers with sheep on agistment have been led to an appreciation of the high-carrying capacity of irrigated grasses and clovers, and most of them are extending their areas of pasture as fast as conditions will permit.

One of the experiments under way at the State Research Farm is a test of the effects of two methods of grazing pasture. In one case two blocks each of 2½ acres of pasture are grazed for ten days alternately; in the other case ten blocks each of half an acre are grazed for two days each in succession. This is referred to now only to state that, under this controlled grazing, remarkably high numbers of growing wethers have been carried in prime condition. The average carrying capacity for twelve months will be approximately twelve and a half sheep per acre, and even in the leanest

period of the year, eight sheep per acre were maintained. These results have been brought about by subdivision which permits the concentration of stock on small areas. The average irrigated block is well subdivided, but on many there is room for improvement in this regard. Without proper subdivision the stock do not use half the pasture; they graze some parts short and neglect the remainder till feed is very scarce, and when they are again put in the paddock they return to the short-grazed patches, while the grass on the uneaten patches deteriorates and may eventually just rot away.

Subdivision, while providing a means for efficient grazing of pasture, may accentuate the trouble unless numbers of stock and grazing periods are adjusted to permit of intensive grazing. The value of rotational grazing lies not so much in the change to fresh pastures which benefits stock, but to the fact that concentration of stock on pasture helps to keep it in the short condition in which it is most nutritious and digestible, and, as been shown, extraordinarily productive.

In the spring the pasture makes such abundant growth that a farmer may not be able to cope with it by grazing. He must have recourse to the mower, and the excess feed may be conserved as silage or meadow hay to be available to supplement the grazing when feed is scarce. It is obvious that this can be done only when the pastures are subdivided, so that one or more paddocks may be reserved for the purpose.

Variety Wheat Tests

Swan Hill Results

THE results of the variety wheat tests conducted by the Department of Agriculture on the farm of G. D. Brydon, Swan Hill, show that yields of up to 22 bushels per acre were obtained from individual plots of the early varieties, despite the adverse season. The wheat was sown in May on soil destitute of any reserve subsoil moisture; June was dry, July and August were satisfactory, but in September drying winds and frosts were prevalent, and in the absence of any good downpour the crops weakened considerably, and were not restored in vigour to any appreciable degree by the unusually good precipitation during October.

The plots were sown on 22nd May on fallow, with 60 lb. of seed and 86 lb. of superphosphate per acre. Eight varieties were tested against Yandilla King as a control, and each plot and control plot of 1-30th acre was repeated eight times to ensure the greatest accuracy.

From a consideration of the results, it became apparent that the land was not of uniform fertility, and that valid comparisons could be made only as between the varieties in each of two groups. In the first group the yield of the controls, Yandilla King, averaged 13.7 bushels an acre, but the early wheat Rajah, under identical conditions, averaged 18.6 bushels; then followed Ranee 16.9 bushels, Nabawa 16.8 bushels, and Penny 13.7 bushels per acre.

In the second group, on somewhat heavier soil, and therefore more adversely affected by the conditions, the control plots of Yandilla King averaged 9.3 bushels an acre. Under identical conditions Sepoy gave a return of 11.0 bushels, Free Gallipoli 9.3 bushels, Currawa 9.2 bushels, and Federation 8.9 bushels per acre.

The year before at Swan Hill, under exceptionally dry conditions, but with a different rainfall distribution, these varieties reacted differently. Penny returned 10.0 bushels, Free Gallipoli 9.8 bushels, Sepoy 9.7 bushels, Yandilla King 9.1 bushels, Nabawa 8.9 bushels, Rajah 8.7 bushels, Currawa 8.6 bushels, Ranee 7.4 bushels, and Federation 6.3 bushels per acre.

The results are consistent, inasmuch as in both seasons Federation is at the bottom of the list with Currawa in close proximity. Further trials over more normal seasons are necessary before any more precise recommendations may be made as to the varieties which are most profitable at Swan Hill; other than that Free Gallipoli, Penny, Sepoy, Nabawa, and Yandilla King are all suitable.

Meadow Competition

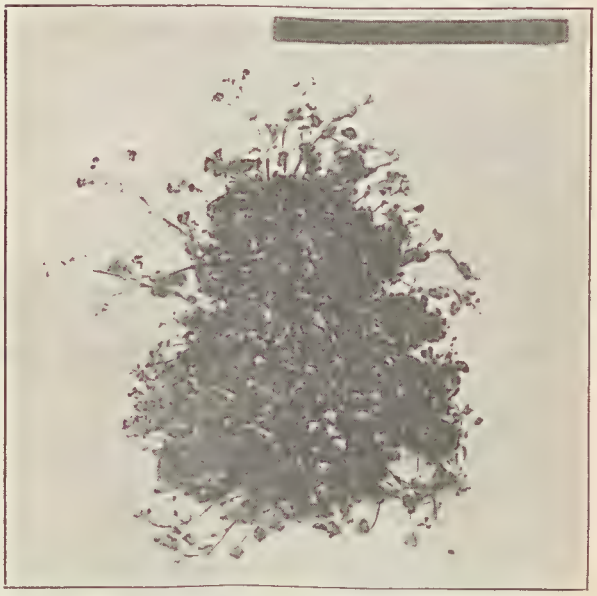
Western District Pastures

Report of the Judge, J. E. HARRISON, B.Agr.Sc., Senior Agrostologist.

THE Yeo and Warncoort Branch of the Better Farming League, Colac, held its first Meadow Competition on the 10th November, 1930. It was also the first contest of its kind to be held in the Western District. The competition is regarded as reflecting not only an increasing interest in the development and management of hay meadows, but also a growing appreciation of the importance of meadow hay as fodder for milking cows during lean periods of the year. It probably indicates also that dairy-farmers are increasing the number of autumn calvers and have more milking cows to feed during the winter. It is an economic problem of first importance to maintain the milk yield of these animals at the maximum profitable output by feeding them adequately and cheaply. Winter grazing alone is seldom sufficient, and frequently provides barely enough for maintenance alone. This is shown by the fact that store animals often lose condition on the same pastures. Supplementary feeding therefore becomes necessary, both to maintain condition and to provide extra food for the production of milk.

There are various means of supplementing the diet during the winter months, as for instance by purchasing concentrates or hay; by making ensilage, cereal hay, or meadow hay on the farm; by reserving special fields in the autumn for winter grazing, or by sowing down crops in the autumn for feeding-off in the winter. As a rule, it is found that combining these various methods of conserving and growing fodders on the farm fits in best with farming operations, but there is usually a best way for each farm which the farmer himself can decide upon once he appreciates the various means at his disposal.

There is little doubt that the conservation of meadow hay or of meadow ensilage is the cheapest means, and as such it is worthy of special study and development. Any light



A Late-maturing Strain of Subterranean Clover from Glen Alvie.
A dense and leafy plant.

thrown on the subject as a result of a meadow competition may be considered to have a definite value in improving methods in grass hay-making, and in encouraging the use of grass hay as a supplementary winter food. At present we must admit that the waste of spring growth is enormous. The buying of extra stock, only to sell them again the next autumn, is not an adequate way to dispose of it. In fact, this probably is not a profitable method, as the stock are usually bought in a high market and often disposed of in a low one, and any milk got from them does not pay for labour, plus the difference between buying price and selling price. The heavy milking season leaves little time for hay-making, and additional stock only increase labour and leave less time still for that important work. It is worth considerable

thought whether it is not better to keep an average number in high production throughout the year than a maximum number in the spring and a minimum number in the winter. If it is so, and there appears to be general agreement that it is, grass hay-making must become more important as one of the several methods that may be adopted for providing food during the lean winter months. It is safe to say that the wide and general use of adequate supplementary winter fodders would increase production from our present herds in a very marked manner. This is being realized by members of herd testing associations, but its full significance and possibilities have yet to be more widely appreciated.

Some general remarks on the exhibits may be made. The first day of inspection was spent at Yeo, in undulating or hilly country, where the soil consists mostly of a medium grey loam of moderate fertility. At Warncoort, on the other hand, there occur extensive areas of heavy flat land, as well as pleasant, undulating country. Yeo is rather more favorably situated so far as rainfall is concerned, receiving 30 inches as against 27 inches at Warncoort. Some areas visited near the Barwon River receive a somewhat higher rainfall still, and appear to be later developing.

As a whole, the meadows exhibited reached a good standard. For the most part they consisted of desirable mixtures of grasses and clovers, and were reasonably free from weeds. It should not be lost sight of that such weeds as capeweed, dandelion, and rib grass, are not only light yielders themselves, but take up a good deal of "elbow room," and crowd out more desirable plants. Most exhibits promised a satisfactory yield of hay. Some, however—those closed rather late in the season and those which contained a high proportion of silver, goose, shivery, and fairy grass—could be expected to return only a light yield. Subterranean clover was undoubtedly the largest contributor in all the heaviest fields of hay, though in some suckling, clustered, and drooping-flowered clover made important contributions. Of the grasses, rye-grass takes first place. This grass, in combination with subterranean and other clovers, formed the most desirable mixtures, and a grower would be well advised, before deciding to reserve a field for meadow hay, to make reasonably sure that it consists mainly of rye-grass and clovers. It is often a matter of expediency, however, and any field from which a reasonable yield of hay can be expected, can safely be shut up for hay, whatever its plants may be.

An Early Strain of Subterranean Clover.
A spreading plant with a minimum of leaf development.

Some irregularities in manuring should receive attention. Several exhibits had been top-dressed for the first time in the year as late as August. This has not been found so satisfactory in either experimental investigations or general experience, as have autumn applications made after the first good rains. It was interesting to note that a number of exhibits had been top-dressed, at least in part, with some nitrogenous manure. In only one instance was the effect outstanding. This was a strip manured with sulphate of ammonia in Mr. W. Kettle's field, on which rye-grass had responded freely to the manure and given a tall, heavy growth that had smothered out clovers and other plants. For the remainder, no difference could be detected by the eye at the time of judging, though many growers remarked that the influence of the nitrogen was observable for a time within a week or so of making the application.

A few fields had been dressed with lime as well, but (it must be stated) in such small quantities as to be more or less insignificant, and unlikely to affect the fields materially.

A dressing of 5 cwt. of quicklime per acre, or approximately 7½ cwt. of slaked lime or 10 cwt. of carbonate of lime, is regarded as the minimum amount worth applying.

It is appropriate to draw attention to the fact that no field exhibited had been specially sown down for meadow hay. The possibility of making use of such fields, which may be cut for two or three successive years, is worth consideration by growers who wish for higher yields of better quality hay. The bulk of seed sown on such a field in the Colac district undoubtedly should be perennial rye-grass and Italian rye-grass. Cow grass, alsike, and lucerne might be sown as the perennial legumes, and subterranean clover in small proportion to take the place of the perennials if they tend to disappear. A suggested mixture is—

20 lb. perennial rye-grass.
10 lb. Italian rye-grass.
4 lb. cow grass.
2 lb. alsike.
2 lb. lucerne.
1 lb. subterranean clover.

Sowing should be made in autumn on a fine, clean seed-bed after the first good rains. A liberal application of phosphates must be employed to secure a full return from the field.

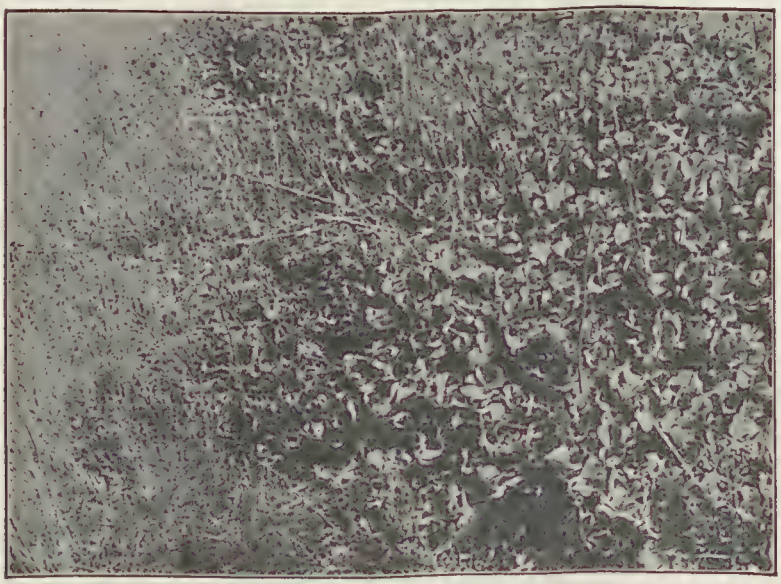
Of the various grasses observed in the district, two come up for special consideration, namely, perennial rye-grass and meadow foxtail. Both spread without cultivation in the district. Perennial rye-grass, having fine stems and small hard seeds, is widely distributed and found under most conditions. Meadow foxtail finds favorable conditions on all rich moist flat land, on which it may occur as an almost pure stand.

Though both are harvested to some extent for seed purposes, their full value is not yet realized. There is undoubtedly wider scope in our markets for the sale of genuine perennial rye-grass seed, from old-established fields such as occur in the district, and it needs but an active, well-organized body to take advantage of the situation. There is increasing interest being taken in meadow foxtail also for its suitability to moist conditions. Though no large quantities of seed are sold locally at present, the market undoubtedly would improve if good seed were available and its wider use in moist situations advocated.

A few special notes of a descriptive and critical nature are appended in regard to each exhibit.

THE EXHIBITS.

The plot exhibited by Mr. S. C. England, and which was awarded the first prize, consisted of a very dense stand of mainly subterrannean clover and rye-grass. In odd sec-



Luxuriant Growth of Subterranean Clover.
Right, top-dressed with 2 cwt. superphosphate ; left, no manure.

tions of the field the perennial rye-grass, unfortunately, had failed, and its place had been taken by inferior grasses such as goose grass and spear grass. A trace of sorrel was the only weed present. The field was sown down to subterranean clover and rye-grass in August, 1927, and top-dressed with 1 cwt. of superphosphate in the autumn of 1928, 1929, and 1930. In August, 1930, one-half of the plot had been top-dressed with an additional 186 lb. of super. per acre; while the other half had received an application of 1 cwt. of ammonium sulphate. The plot was closed on 1st September. The crop was heavy and uniform, and would cut a large bulk of nutritive and palatable meadow hay.

Mr. W. G. England's exhibit, which secured second place, was one of particular interest, in that it was sown down six years ago to subterranean clover, and since then has been harvested twice for seed. It has also been cut three times for hay. Super. had been applied at the rate of 1 cwt. per acre in 1928 and 1929. During 1930 the plot was top-dressed with 1 cwt. of super. per acre on 8th July and again on 23rd July. The field was closed to stock on 1st July. At the time of judging the plot consisted of a very dense and uniform stand of subterranean clover, with rye-grass abundant and only a few scattered weeds. A heavy yield of nutritious and palatable hay should be obtained from this field.

The third prize was awarded to Messrs. Mansell Brothers, whose plot consisted of a very dense stand of subterranean clover freely intermingled with Yorkshire fog and silver or hair grass. It was sown down with 2 lb. of subterranean clover seed per acre in 1926, and has since been top-dressed annually with 90 lb. of superphosphate. On 29th April, 1930, it had been top-dressed with 90 lb. of super. per acre, and on the 15th August two-thirds of the field received 90 lb. of sulphate of ammonia per acre, and one-third was given a dressing of lime at the rate of 90 lb. per acre. On 20th August, 294 sheep were removed. The paddock was then harrowed and closed to stock. No difference in growth on the sections treated with the various manures was apparent at the time of judging. A very heavy crop of meadow hay should be cut from this plot.

Mr. C. T. Reeves' exhibit was interesting, in that it had been cropped some seven years ago, and since then had been given annual dressings of super., no grass or clover seed being sown. It now consists of a mixture of perennial rye-grass and subterranean clover in nice proportion. Patches of capeweed, however, detract from the appearance and hay-making qualities of the field.

From the point of view of interest Mr. R. J. Ball's exhibit was second to none, consisting as it did of an almost pure stand of meadow foxtail to the practical exclusion of all else. This grass is particularly suited to moist conditions, and is very nutritious and palatable, but unfortunately a light yielder of hay. Occasional plants of rye-grass, strawberry clover, and fenugreek were seen.

Mr. F. J. England's exhibit was one of dense subterranean clover and rye-grass, but patchy with capeweed. The field was sown down in 1918, and has been top-dressed with super. at the rate of 75 lb. per acre for the last five years.

The plot exhibited by Mr. W. E. Kettle was also of interest, because it had been subdivided into four sections, which were treated with nitrate of soda, sulphate of ammonia, super. only, and blood and bone respectively. The section treated with sulphate of ammonia carried a very dense growth of rye-grass, which had practically excluded everything else except subterranean and clustered clover. The other sections of the field were also very even; but as a whole the area could not be considered very uniform. A heavy yielding crop of nutritious and palatable hay should, however, be harvested.

Messrs. J. and N. Hancock's plot also had been treated with various manures, but differences in growth were not apparent at the time. The field, unfortunately, contained a considerable proportion of the lesser grasses, such as Yorkshire fog, goose grass, and hair or silver grass, and annual clovers of low nutritive value.

Mr. T. Kettle's first plot was a fairly uniform but light stand of perennial rye-grass twelve years old. Annual clovers such as suckling clover were present. Dandelions were plentiful, and occupied space which more valuable pasture plants might hold. A light but nutritious and palatable hay should be cut.

Mr. G. E. England's plot was one on which an attempt has been made to re-condition a native pasture by means of annual dressings

of superphosphate. At the time of inspection the clovers present were mainly subterranean and yellow suckling, and while the grasses were in general of inferior quality a sprinkling of perennial rye-grass was apparent.

Messrs. Eades and Cobbledick's two exhibits were in the one field, and consisted of an old stand of perennial rye-grass and suckling clover. One exhibit contained more clover than the other, but in other respects both were very similar, and could be expected to yield a light but fairly nutritious crop of hay.

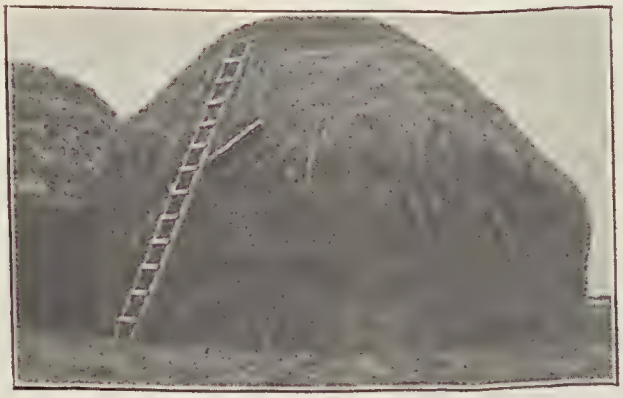
Mr. T. Kettle's second plot was one which had been sown down in April, 1927, with 12 lb. perennial rye-grass, 2 lb. subterranean clover, and 2 oz. of wild white clover, with 1 cwt. of super. per acre. It now consists of a mixture of subterranean clover and rye-grass, with odd plants only of white clover. Only a light crop could be expected from the field, but one which should be fairly nutritious and palatable.

The awards are as follow:—

Yeo and Warncoort Branch, Better Farming League, Colac.

Name.	Apparent Yield.	Nutritive Value.	Palatability.	Freedom from Weeds.	Total Points.
England, S. C. ..	40	23	13	10	86
England, W. G. ..	38	22	13	10	83
Mansell Bros. ..	40	22	12	8	82
Reeves, C. T. ..	38	22	13	8	81
Ball, R. J. ..	33	22	13	10	78
England, F. J. ..	33	22	13	8	76
Kettle, W. ..	33	22	13	8	76
Hancock, J. and N.	35	21	11	8	75
Kettle, T. (*a*) ..	28	23	13	8	72
England, G. E. ..	30	21	11	9	71
Eades and Cobbledick (*b*) ..	30	21	11	9	71
Kettle, T. (*b*) ..	28	22	12	9	71
Eades and Cobbledick (*a*) ..	30	20	11	9	70

A Good Standby



This stack of grass and clover hay was cut from 4½ acres, the actual yield of hay being 3 tons 1 cwt. per acre.

Ainsbury Fallows

The fallows submitted in the Ainsbury District Competition were of a high standard, nearly all competitors exhibiting excellent judgment in cultivating to arrest, as far as possible, the danger of drift. Unfortunately, a particularly severe windstorm swept the district on the day prior to judging, with the result that several fallows which, owing to their location and soil type were much more liable to drift than others, were greatly handicapped by this factor. As far as possible this feature was allowed for in judging.

There is one redeeming feature about drift, in that it greatly enhances the crop-yielding capacity of the flats on which it lodges and, in this district, it is generally very easy to form another mulch on the surface from which it has blown away.

In nearly all cases fallows were left ridged at right angles to the line of drift. In one or two instances, however, paddocks were so shaped that this method of working was rather difficult. As far as possible, fields in the Mallee should be laid out with the idea of facilitating cultivation across the direction of the prevailing winds.

Dairy Farm Competition

State-wide Contest

By W. J. Yuill, Senior Dairy Supervisor.

DURING last year the Council of the Victorian United Cow Test Association inaugurated a dairy farm competition which has regard to every phase of dairy farm activity, and which, it is claimed, is the most comprehensive dairy farm competition yet drawn up.

The 140 Herd Testing units throughout the State were grouped into ten zones as follow:—

Zone No. 1.—Walwa, Corryong (Upper Murray), Tallangatta, Eskdale, Kiewa Valley, Wodonga.

Zone No. 2.—Myrtleford-Whorouly, Moyhu, Milewa, Swanpool, Alexandra, Seymour, Broadford, and Kilmore.

Zone No. 3.—Stanhope, North Murchison, North Shepparton, Tongala, Katandra West, Werribee.

Zone No. 4.—Cohuna, Leitchville, Kerang, Swan Hill, Koroop, Murrabit, Pyramid Hill, Rochester.

Zone No. 5.—Coleraine, Casterton, Merino, Wurt Wurt Koort, Penshurst, Condah Swamp, Portland, The Sisters, Mortlake, Port Fairy (South Western), Derrinallum, Warrnambool, Macarthur, Paschendale.

Zone No. 6.—Pomborneit, Nalangil, Becac, Ondit-Irrewarra, Apollo Bay, Winchelsea, Dreeite South, Ballarat, Talbot, Newstead, Noorat, Camperdown, Keayang, Cobden.

Zone No. 7.—Cann River, Orbost, Bairnsdale, Sale, Maffra, Traralgon, Yinnar.

Zone No. 8.—Warragul, Gainsborough, Jindivick-Neerim, Narracan Shire, Boolarra, Mirboo North, Pakenham, Bunyip.

Zone No. 9.—Yarram, Toora and Welshpool, Stony Creek, Dumbalk North, Tarwin Lower, Leongatha.

Zone No. 10.—Wonthaggi, Loch, Mountain View, Kongwak, Poowong, Lang Lang, Cranbourne, Korumburra.

Identity of conditions was taken into consideration as far as possible in drawing up the boundaries of the zones. The irrigation farms of the Goulburn Valley and northern areas were in zones 4 and 5; the farms of the north-east were placed in zones 1 and 2. The heads under which points were allotted to entrants were as follows:—

FARM MANAGEMENT.

Section B.—Maximum Points, 150.

	Points.
Lay-out of Farm. Economy of Labour. Easy Working	35
Sanitation. Utensils. Machinery. Sheds. Yards and Drainage. Gateways and Approaches	35
Milk or Cream Storage. Cooling Systems	20
Water System. Stock. Domestic	20
Shelter and Shade	10
System of Bookkeeping	10
Home	20

A Continuous Fodder Supply on a Tongala Irrigation Block.

On the left, Early Maize; in the centre, Imphee; on the right, Late Maize.

Breeding and Production.

Section C.—Maximum Points, 250.

Herd Sire—Registered Pure Bred	50
Production of Herd Sire's—Maternal Dam; Paternal Dam	30
Production of Herd	50
Production of Junior Cows. Improvement over Dam's Records	50
Young Stock under two years old	30
Appearance, Condition, and Quality of Stock	30
Bull Pen or Paddock	10

Utilization of Whey or Skim Milk.

Section D.—Maximum Points, 55.

Pigs—Breeding. Boar. Sows	35
Poultry—Breeding. Housing	20

Pasture and Fodder Crops.

Section E.—Maximum Points, 340.

Area of Permanent Grazing	50
Area of Supplementary Crops	40
Fodder Reserves——Hay. Roots or Ensilage	50
Condition of Pastures or Legume Areas	100
Area receiving Fertilizer. Amount of Fertilizer used	100

Net Return per £100 Capital Value.

Section F.—Maximum Points, 50.

Grand Total Maximum Points 845

The competition, the period of which was for the twelve months ended 30th June, 1930, was made possible by the generosity of the Commonwealth Fertilizers and Chemicals Limited, which donated silver cups for each of the zone competitions, and also a perpetual challenge shield for inter-zone competition; this shield will be awarded each year to the zone in which reside the owners of the four farms securing the highest number of points in any zone. A miniature of the shield is awarded to the owners of each of these farms.

The Judging.

The judging of the competing farms was carried out by the Senior Dairy Supervisors of the Department of Agriculture during October and November last. In allotting points they took into consideration the sanitary condition not only of the dairy and yards, but of all their surroundings, the care and treatment of cream, water supply for the stock and for household purposes, the provision of shade and shelter, the system of bookkeeping, and the way the home had been planned. While there are general principles regarding the methods of awarding points under these several heads, at the same time a judge must always be prepared to allot points for any special features that make for efficiency.

One reason for dividing the State into zones was the desire to eliminate to some extent inequalities due to climatic conditions, &c. The competition has proved definitely, however, that such factors as high rainfall and river flats are by no means the main essentials to successful dairy farming. Managing ability, the wise purchase of stock, a sound system of pasture development and fodder reserves—these are factors which may outweigh natural advantages. The interest bill on an over-capitalized farm may well be the cause of failure. On the farms in the competition the interest bill per cow varied 500 per cent.

In assessing the measure of success of each farm as a business, the usual system of comparing returns on a "per cow" and "per acre" basis was discarded, and instead comparisons were made on the return received "per £100 of farm value." Taking into consideration only the yields per acre and making no allowance for the great variation in acre values is a most unsatisfactory method of judging in inter-farm competitions. The acre values of the different farms entered for the competition now under notice varied greatly. In one zone with a 20-mile radius they range from £12 to £60; in another from £5 to £52.

The value of each farm in the competition was fixed by a committee consisting of the owner, the judge, and a local authority appointed by the association executive. Of course, there was a very wide range of values. When they were as low as £50 per cow 25 points were allotted; for each £10 rise in value a point was deducted; thus, 20 points indicates that one cow is maintained on land estimated as worth £100. An analysis of the returns shows that—

Five farms required land worth £50 to maintain a cow, and were allotted 25 points;
Eleven required land worth £60 to maintain a cow, and were allotted 24 points;
Twelve required land worth £70 to maintain a cow, and were allotted 23 points;
Twelve required land worth £80 to maintain a cow, and were allotted 22 points;
Fourteen required land worth £90 to maintain a cow, and were allotted 21 points;
Sixteen required land worth £100 to maintain a cow, and were allotted 20 points;
Twelve required land worth between £100 and £200 to maintain a cow; and
on two farms the land required for one cow was valued at over £200.

The highest net return (having regard to the value of the land) of any competitor was that of Mr. G. P. Bubb, of Moe. This farm is situated in the steep-hill country of South Gippsland, but its unfavorable situation was, under the scheme followed, no bar to its being judged the leading farm in Zone 8, although several of the farms with which it competed consisted of some of the richest land in the State. Less than ten years ago this property was a wilderness; to-day it is a revelation in pasture development. The only cash expenditure on the land during the year was £75 for fertilizers. Mr. Bubb's actual net returns for the year were £51 12s. for every £100 of farm valuation.

The return from the farm of Messrs. Cameron and Field at Orbost represented £42 for each £100 of farm valuation. There was no expenditure on the farm during the year for fertilizers nor for concentrates. It is interesting to note that the winning farms

Ideal Water Supply.

in Zones 1, 3, and 5 showed the highest feed cost in their respective zones, and also the highest net returns.

To many dairy farmers the low prices now offering for all produce must be a nightmare, but even with present prices the efficient farmer can obtain an adequate return for his work.

The highest gross return from any farm in the competition was £2,060; this was for cream and pigs; the area of this farm is 165 acres. On one farm a sum of £700 was received from the sale of pigs. From this source thirteen farms averaged £460.

A comparison of herd returns from cream and pigs per cow is shown in the following table, in which the herds have been grouped according to the numbers of cows:—

Groups of farms as under.	Average returns of cream and pigs per cow.			
	Average number of cows.	Average return per cow.	Highest herd of group returned per cow.	Lowest herd of group returned per cow.
		£	£	£
10 farms milking between 60 and 90 cows	72	25	30	20
19 farms milking between 40 and 59 cows	48	26	35	16
38 farms milking between 20 and 39 cows	27	31	48	14
16 farms milking under 20 cows	14	34	53	21

The Dairy Stock.

A striking feature of the competition was the splendid stock seen in all districts. On every farm the bull was pure bred, though in a few cases unregistered. With few exceptions the bulls were from standard test cows of high-producing capacity. In nineteen instances the herd sire had a butter-fat backing in his maternal and paternal dam's record of more than 950 lb., and in thirteen cases the record was over 1,000 lb. Messrs. Moore and Company, of Yarram, Mr. R. Andrews, of Eskdale, and Mr. R. J. Flegg, of Kerang, each had a herd sire of "Somerville" breeding. Mr. Flegg's bull is from Beauty 4th of Somerville (713 lb. butter-fat), by a son of Babs of Somerville (843 lb. butter-fat).

High-Producing Junior Cows.

The high production of the junior cows was very noticeable; in fact, it obtained on six out of the ten winning farms. In 45 per cent. of the herds there were junior cows whose yields (when age allowances were added) exceeded the averages of the mature cows. In the case of Messrs. D. and M. A. Poole's junior grade and pure-bred Ayrshires the difference was as much as 39 per cent.; in nine other herds the juniors' advantage was over 20 per cent., and in eleven instances it was over 10 per cent.

A Stack of Lucerne grown without Irrigation at Casterton.

Filling the Silo.

Comments on Some of the Farms.

It has long been a charge against our farmers that they make little effort to beautify their home surroundings. Generally, I fear, this is true, and too often one finds a farm on which there is scarcely a tree to give stock shelter from the winds of winter and the scorching heat of summer. One has only to see cattle sheltering on the lee side of a hedge during cold weather, or lazily chewing the cud in the shade on a sweltering hot day, to realize the value of a plantation of trees. On some of the farms in the competition there were fine homes which could not be allotted full points owing to the absence of shade trees, orchard, and gardens.

The telephone, the motor car, and wireless have done much to overcome the isolation and loneliness that once were associated with farm life, and there is a growing tendency to make improvements which will lighten the tasks of the women folk. In the homes of many competitors electric light has been installed, and at the farm of Mr. H. Beisterfeldt, at Ruby, the cow shed and other out-buildings are lit by electricity. When erecting his concrete silo of 140-ton capacity this farmer carried the walls up high enough to give a water storage of 2,000 gallons. This is filled from a 27,000-gallon tank which collects all of the roof water. From these tanks water is reticulated throughout the property. The cows are milked by electric power and the separator, pump, chaff-cutter and silo-blower are all electrically driven.

Streams and springs may be harnessed in many ways to provide a permanent water supply, which greatly improves the lot of the farmer and his family. The "will to do" is often the only factor needed. Water is laid on to many of the homes inspected. It is not an uncommon thing to hear country people speak enviously of suburban lawns. We all know how refreshing a lawn appears on a hot day, and how pleasant it is to stretch out on it in the cool of the evening. At the farms of Mr. J. Mapleston, of Jindivick, Mr. A. Crosthwaite, of Kiewa Valley, and Mr. M., Reed, of Toolamba, there are beautiful lawns. Mr. Mapleston's water supply is obtained from a small stream half a mile from the house, and from a storage tank water is reticulated throughout the home, sheds, and garden. Mr. H. Hayward, of Casterton, has built a bank 20 feet high across a depression, and from the supply thus held water is pumped a distance of 2,600 feet into a 3,000-gallon galvanized iron tank which is 240 feet above the level of the reservoir. From the tank water is reticulated to the home and garden, and by means of ball taps and troughs supplies are maintained in many of the paddocks.

Cutting Maize for Ensilage.

Pastures and Fodder Reserves.

Although twenty farms were allotted over 90 points for pastures, another 28 grew upwards of half an acre of supplementary crop, such as oats, sorghum, millet, or maize, and on each of another twenty there was stored 50 tons of hay, yet in every district visited there was shown a lack of appreciation of the wisdom of conserving pasture as hay or silage.

On some farms supplies of ensilage were seen. At Messrs. Walker Brothers' property at Yinnar there was 100 tons, and at Mr. Bubb's farm at Moe, in addition to 100 tons of ensilage, there was a stack of 80 tons of hay made from grass and red clover. At Messrs. D. and M. A. Poole's the pasture gave an actual yield of 3 tons per acre of grass hay. Mr. Beisterfeld's 140-ton silo had been filled from 15 acres of mixed pasture in which red clover predominated. Many other instances could be quoted from among the competition entrants; but all the same, very few farmers have made the most of a wonderful opportunity to convert surplus fodder into either ensilage or hay. Thousands of tons of grass throughout the State rot or burn every year.

When pastures were being judged, points were awarded for density, leafiness, and succulence as well as for the absence of coarse grasses and weeds. The pasture of the whole farm was considered, and not simply that on one paddock or on only a few acres. For every twentieth of an acre of supplementary crop grown one point was allotted.

In allotting points for farm management, the layout of farms for controlling pasture and stock was considered. Messrs. Moore and Company, of Yarram, Mr. E. J. Hamer, of North Shepparton, Messrs. Firth Brothers, of Ballendella, and Mr. G. Wickham, of Maroon, were allotted the maximum in this section. Messrs. Moore and Company have twenty 5-acre paddocks, each supplied with permanent water. It is usual to harrow these paddocks once a month. Mr. Hamer's farm of 67 acres is divided into 23 paddocks. Here, too, frequent harrowing is carried out.

Farms in hill country do not permit of such easy working as do those in the districts just referred to. The farm of Mr. L. Jones, of Dollar, consists of 130 acres, and has been divided into 23 paddocks. At a casual glance one might be inclined to say that the subdivision is not quite so satisfactory as it might be, yet probably it could not be bettered, for in steep country winding tracks must be provided for the cows.

The points allotted to the leading farms in the various sections are given below:—

Name.	Association.	Points.
SECTION B.—FARM MANAGEMENT.—MAXIMUM POINTS, 150.		
M. Considine ..	Stony Creek ..	142
A. Crosthwaite ..	Kiewa Valley ..	140
J. A. Ford	" " ..	139
Moore and Co. ..	Yarram	139
H. Furphy	Dumbalk North ..	136
Firth Bros. ..	Rochester ..	136

Name.	Association.	Points.
SECTION C.—BREEDING PRODUCTION.—MAXIMUM POINTS, 250.		
D. and M. A. Poole ..	Lang Lang ..	191
Hempell and Walker	Kiewa Valley ..	186·9
Luke Jones.. ..	Dumbalk North ..	185
C. Wightman ..	Alexandra.. ..	180
J. A. Ford	Kiewa Valley ..	179·1
A. and R. J. Dobson	Alexandra.. ..	178
SECTION D.—MAXIMUM POINTS, 55.		
Hy. Beisterfeldt ..	Leongatha ..	55
J. L. and E. J. Henderson	Millewa	51
G. A. Bright ..	Stony Creek ..	50
Dobson and Andrews	Alexandra.. ..	50
R. W. Christie ..	Beeac	50
Walker Bros. ..	Yinnar	49
SECTION E.—MAXIMUM POINTS, 340.		
A. Foster	Maffra	270
J. F. Keating ..	Gainsborough ..	271
G. P. Bubb.. ..	Narracan Shire ..	269
J. A. Ford	Kiewa Valley ..	268
M. Considine ..	Stony Creek ..	261
E. Coghlan ..	Walwa	260
SECTION F.—MAXIMUM POINTS, 50.		
G. P. Bubb.. ..	Narracan Shire ..	50
Cameron and Field ..	Orbost	42
H. Haywood ..	Casterton	39·7
G. Wickham ..	Winchelsea ..	39·1
D. H. Jenner ..	Kerang	39
S. G. Thomas ..	Yinnar	38·4

The Inter-zone Competition.

The winner in the inter-zone competition was Zone 2—an area extending from Melbourne to Wodonga. The challenge shield will be held on behalf of this zone till next year's competition is decided. Of the four leading farms in the zone three belonged to members of the Alexandra Association and one to a member of the Millewa Association.

Zone 9, which includes the country between Leongatha and Yarram, took second place. All the competing farms in the winning zone consisted more or less of river flats, but in Zone 9 two of the leading farms are in steep-hill country, another certainly has the advantage of a river frontage, but has only a very limited acreage of flats, while the fourth farm is a reclaimed swamp. On seven of the farms there were Jersey herds, either grade or pure bred, on the other Red Polls.

An analysis of the position shows that although the Gippsland farms had a lead of 17 points in the section for farm management, and 86 points for the excellence of their pastures, this commanding lead was offset by the general effort on the part of the north-eastern competition in the growing of supplementary crops and hay reserves.

The average value of farm required per cow was £68 in the north-east as compared with £90 in Gippsland. Although the capital value of farms in Zone 9 was 33 per cent. higher than was that obtained in Zone 2, the net returns from the Gippsland farms averaged £961 as compared with £629; this difference was in the main due to there being a smaller number of cows in the herds in Zone 2 than in the Zone 9 herds.

The farms in Zone 2 scored well under the heading of "Breeding and Production," and finally this zone won by 29 points. Third place was filled by Zone 1, followed by Zone 4, which consists of irrigation farms from the area situated between Rochester and Swan Hill.

Details of farms in the winning zones are given in the following table:—

Herd Owners.	Association.	Breed.	Points Awarded.
FIRST PRIZE.—ZONE 2 (MELBOURNE TO WODONGA AREA).			
Dr. J. L. & E. J. Henderson ..	Millewa	Regd. Jersey	621
A. & R. J. Dobson ..	Alexandra	Regd. Jersey	616·6
Dobson & Andrews..	,,	Grade Jersey	614
C. Wightman ..	,,	Red Poll ..	567·4
Aggregate number of points of the four winning farms			2,419
SECOND PRIZE.—ZONE 9 (LEONGATHA TO YARRAM).			
Luke Jones ..	Dumbalk North	Grade Jersey	630
James Pearson ..	Stony Creek	Pure & Grade Jersey	589·5
Moore & Co. ..	Yarram	,, ,,	585·5
Hy. Beisterfeldt ..	Leongatha	,, ,,	585
Aggregate number of points of the four farms			2,390

A comparison of the zone winning farms can be made from the table on the next page. It will be noted that although the zones were judged by different officers in a great variety of conditions, there is only twenty points difference in the last seven zones. This may be taken to indicate the soundness of the scheme for a State-wide competition of this nature.

Comparison of the Winning Herds of the Ten Zones.

Sections.	Best 10 Herds.									
	A. J. Ford, Kiewa Valley Assoc. (Zone 1).	L. Jones, Dumbalk Assoc. (Zone 9).	Dr. J. L. & P. I. Henderson, Millewa Assoc. (Zone 2).	Walker Bros., Yinnar Assoc. (Zone 7).	Hugh Haywood, Casterton Assoc. (Zone 5).	F. A. Williams, Rochester Assoc. (Zone 4).	D. & M. A. Pool, Lang Lang Assoc. (Zone 10).	G. R. Bubb, Narracan Assoc. (Zone 8).	R. W. Christie, Deeac Assoc. (Zone 6).	P. Freestone, North Murchison Assoc. (Zone 3).
Section B.										
1. Layout of farm, &c.	32	30	33	26	25	28	33	23	28	32
2. Sanitation	33	30	33	28	35	32	33	18	21	30
3. Cream storage	18·5	18	13	18	17	20	16	12	8	16
4. Water supply	20	18	19	15	20	16	18	12	20	16
5. Shelter and shade	8	8	9	8	9	8	8	4	6	9
6. Bookkeeping	8	8	7	10	7	6	10	8	4	8
7. Home	19·5	20	19	14	16	16	16	12	12	19
Total Section B	139	132	133	119	129	126	134	89	99	130
Section C.										
8. Herd sire	50	50	50	50	50	50	50	50	50	50
9. Production of ancestry	16	21	20	20	4	22	19	21	17	20
10. Butter-fat return per £100 of farm	36·7	47	45·4	33·2	43·8	30	24	44	22	40·7
11. Butter-fat increase of junior cows over mature cows	11·7	13·5	..	8	11·6	..	39	..	3	..
12. Proportion of junior cows to milking herd	28·7	18	18	15	17·6	21	27	11	30	12·4
13. Inspection stock	26	28	28	28	22	30	24	26	30	30
14. Bull control	9	8	10	7	7	8	8	6	8	8
Total Section C	178·1	185·5	171·4	161·2	156	161	181	158	160	161·1
Section D.										
15. Breeding of pigs	35	15	35	35	35	25	..	10	35	..
16. Poultry breeding and housing	12	20	16	14	10	8	16	8	15	13
Total Section D	47	35	51	49	45	33	16	18	50	30
Section E.										
17. Permanent grazing per cow	24	25	23.8	20	24	18	21	24	23	20
18. Supplementary crops	10	10	5	..	1	..	37	15	..	..
19. Reserves of fodder	38	21	34	50	35	25	12	50	50	27
20. Condition of pastures, &c.	83	90	78	75	70	95	90	80	100	95
21. Fertilizers	100	100	100	100	100	100	57	100	83	100
Total Section E	255	241	240.8	245	230	238	217	269	256	242
22. Net returns per £100 of farm	25·6	31·5	24	26·6	29·7	33	32·5	50	18·7	34
Grand Total	644·7	630	619·4	600·8	598·7	591	590·5	584	583·3	580·1

The Webbing Spider of Citrus Trees

Suggested Method of Control

By S. A. Cock, Citriculturist.

THE webbing spider of citrus trees has been in evidence in the northern part of Victoria for the last twenty years. At some periods it has been more plentiful than at others, a fact that may be accounted for by control through natural enemies. Some time ago inquiries were made from Tresco and the Long Lake districts as to methods of control of the spider, and what was known about it in Victoria.

Accordingly, specimens were submitted to Mr. C. French, Government Biologist, who pointed out that the spiders spin webs in the citrus trees, matting leaves and small branches in small clumps. The leaves, &c., concerned are unable to function and die. As a tree may become virtually covered with these masses of webbing, it has a serious effect on its vitality.

Mr. French adds—

"Owing to the conspicuous nature of the pest, it is easy to see the beginning of an infestation in a grove when mechanical methods may be used and the trouble eliminated. If the seriousness is not realized and steps are not taken early in the infestation, it is extremely difficult to deal with, as no methods other than pulling off and burning seem to be effective.

"Spiders in webbing obtained from infested areas have been identified as *Lampona obscoena,* but the specialist in this group (Mr. S. Butler) states that he knows of no work relating to the economic aspect.

"Amongst the material obtained were a number of hymenopterous parasites on the spiders, and also large numbers of ants (*Iridomyrmex punctatissma*) which were apparently living on the eggs of the spider. These parasites are no doubt of considerable assistance in checking the spread of the spider, and it may prove possible to artificially increase the numbers of the parasite."

An affected Citrus Tree at Long Lake.

The methods of control suggested by the biologist are identical with those which have been in operation for years past. Some growers, however, have been reluctant to undertake the work of tearing the webbing apart, and of collecting the debris and burning it. Further, the work is liable to injure the hands unless they are protected, and this has made some people avoid the work. However, despite these strenuous methods, the pest has increased. In order to find an easier method of dealing with the pest at Long Lake, Mr. D. D. Brown, citrus supervisor, of Swan Hill, during the past twelve months has given intensive attention to the habits of the spider and to control methods by sprays, &c. His report is given in full hereunder:—

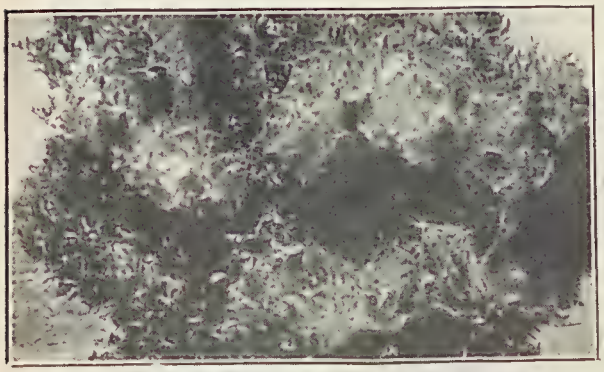
"During the last few years the webbing spider (*Lampona obscoena*) has been attacking orange and lemon trees in the Long Lake district, and to a lesser extent in Tresco and

Murrabit. The spiders are a light grey in colour, about one-quarter of an inch long. Although not actually attacking the trees themselves, they spin their webs in them, and by at first webbing one or two leaves together, gradually increase until leaves and branches are included and bunched together in a large unsightly mass. These webs vary in size, many, in neglected cases, being two square feet in extent, and when a dozen or more of them may be seen on an average size tree, the effect can be imagined. Twigs and leaves are choked through lack of air, and die, the fruiting of the tree is interfered with, while in some cases scale insects are encouraged in the dark and shady surroundings of the webs, and spread rapidly to other parts of the tree. If allowed to spread, the spiders retard the trees' growth so much that they soon become unprofitable. Realizing this, some growers cut off or tear out the webs by hand, and burn them in a tin vessel carried round for that purpose. There are objections to this method of control, as it is slow and uninviting, and if the work be carried out carelessly, many spiders, especially in the tearing-out process, escape to the ground; they then make for the trunk of the tree and climb up on the limbs again. In the spring hundreds of young spiders may be observed thus escaping from any disturbed web.

A Spray from an Affected Tree.

"The spiders are not so active during the winter. Eggs—100 or more—are deposited in characteristic spider sacs and hatch out in the spring, usually about the end of October, but breeding continues more or less throughout the year. From then on during the summer they are very active, spreading from tree to tree in web fashion, and their webs will collect on the face, hands, and clothes of any one walking among the trees, especially in the evening or on a still, cloudy day. Their food is any winged insect caught in the web. Observations that have been made discount the idea that they attack scale pests; on the contrary, as already stated, the scale seems to multiply in the webbed mass.

In an endeavour to find out some more effective means of control, experiments have been carried out with various substances and solutions, such as butyl alcohols, sodium and barium dusts, poisonous baits, arsenic, kero-



A Badly Webbed Orange Tree.

sene, and pyrethrum. Although it was found that most of these gave more or less satisfactory results, once they came in contact with the insects, the trouble was to penetrate the remarkably effective protection offered by the webs, before a "commercial kill" could be obtained. The best results obtained so far have been with pyrethrum, kerosene being used as a base; the kerosene acts to a certain extent as a penetrating agency, and the pyrethrum as a toxic. When sprayed on very small webs consisting of a few twigs or leaves bunched together, it was found to have sufficient penetrative action to reach and kill the spiders contained therein. On large webs the kill depended on the penetration of the spray, but if the web was torn apart before being sprayed, practically every insect hit was killed within a few minutes. Escaping insects were killed by spraying them below the webs as they spun to the ground. Based on these tests, a thorough spraying towards the end of October, when the insects were young, gave an 80 per cent. kill, and another about three weeks later, in order to catch the later hatch and those missed previously, gave effective control. On those groves where the pest is bad, a further application may be necessary.

Owing to the necessity of directing the spray into localized areas on the trees, and to avoid wetting the assistant while he was opening the web, the use of power sprays is not recommended. As pyrethrum is expensive, it will be found more economical and efficacious to use a small hand spray which could be held as close as necessary to the opened web, and directed wherever required.

The spray mixture is prepared by heating 4 oz. of soap in 2 pints of water, until dissolved. When dissolved and in its heated condition, add 2 pints of kerosene and emulsify until the solution is of the constituency of cream, after which dilute to 3 gallons of mixture by the application of water. To this slowly add one and a half pounds of pyrethrum, and mix thoroughly while adding until dissolved. The spray should be used as soon as possible after mixing. Three gallons of the mixture will spray many trees if applied to the affected portions only. It is recommended that a cool day be selected for the work, as the kerosene solution—one in twelve—is fairly strong and liable to burn if used during hot weather. A weaker mixture—one in fifteen—would guard against leaf burn, but this will weaken the spray's penetrating powers, and render it less effective."

The results obtained by Mr. Brown in these tests show considerable promise, but it is proposed that further experiments on the control of this pest shall be carried out in the near future.

Webbing Spider on a Sugar Gum at Long Lake.

Smut in Oats

Dry Pickling Effective

By W. B. Miller, M.Agr.Sc., Inspector of Agriculture, and J. A. Morrow, B.Agr.Sc., Cereal Experimentalist.

THOUGH pickling to prevent ball smut in wheat is general, few farmers attempt to control the most important diseases of oats, namely, loose and covered smuts. Until recently the means available for the control of these diseases have been unsatisfactory, inasmuch as they involved pickling with solutions of bluestone or formalin, which, although effective fungicides, often decreased and retarded the germination to such an extent that farmers preferred to risk disease infection. The difficulty usually experienced in forcing the swollen grain through the drill was another practical disadvantage of the wet method.

Recent experiments at the Rutherglen Experiment Farm have shown that the dry pickling method, now generally used to control ball smut in wheat, is also a reasonably satisfactory method for the control of oat smuts.

Smut of Oats.

It occasionally happens that seasonal and other conditions favour the disease, in which case heavy infection occurs. During the last two seasons such conditions have prevailed, and in some parts of the State many of the crops were heavily smutted, up to 35 per cent. infection being recorded. This represents a heavy loss to the farmers concerned; and, as such conditions are liable to occur during any season, it would be wise to take precautions to guard against a recurrence of the outbreak.

Description of the Diseases.

There are two distinct species of smut fungi which attack oats—the loose smut (*Ustilago avenae*), which is the more com-

mon in Victoria, and the covered smut (*Ustilago levis*). Neither disease manifests itself until the heading stage, when the loose smut appears as black dusty spores, causing the complete destruction of the grain, and quite often of the surrounding glumes or chaff also. The covered smut also causes the destruction of the grain, but the protecting glumes are left more or less intact, and so partly conceal the smut. In some cases, only the lower part of the head is affected.

Means of Infection.

The black, dusty spores of the loose smut are spread by the wind soon after the diseased head emerges, leaving only the bare backbone. These spores, the means by which the fungus is carried on from year to year, may alight on neighbouring healthy-developing grains, where they remain, either as spores or as dormant fungus threads inside the hull of the grain, to attack the young seedling in the next season. The seed may be further contaminated during the harvesting process.

After the young seedling is attacked by the adhering spores, the fungus grows up within the developing plant, which shows no signs of the parasite within it until heading time, when the black spore masses are again reproduced.

The covered smut, although a distinct disease, has a similar life history. In fact, both these oat diseases are similar to ball smut of wheat in so far as the infection takes place from spores carried on the outside of the grain. The object of pickling is to kill the fungus before it can attack the young seedling.

No other satisfactory method of controlling oat smuts is known. In some seasons the conditions for infection apparently are unfavorable, with the result that comparatively clean crops are obtained. However, unless seed from a clean crop is sown, pickling is necessary to avoid the risk of heavy losses.

Experiments at State Farm, Rutherglen, 1929 and 1930.

The use of dry pickles, such as copper carbonate, has been discounted on the grounds that the structure of the oat grain would not permit intimate contact between the fungicide and the spores of the disease. The absence of conclusive tests in Australia hitherto has prevented the confirmation or denial of this belief.

With the object of determining the most satisfactory method of controlling oat smuts a series of plots was laid out at the Experiment Farm, Rutherglen, in 1929. Algerian oats known to be infected with smut were treated by various pickling methods and sown on the following day with the drill at the rate of 65 lb. per acre. Super. at the rate of 1 cwt. per acre was applied with the seed, which was treated as follows:—

Plot 1.—Unpickled.
Plot 2.—Dry pickled with copper carbonate, 2 oz. per bushel.
Plot 3.—Immersed in 1/350 formalin solution for ten minutes.
Plot 4.—Immersed in 1/350 formalin solution for three minutes.
Plot 5.—Immersed in 1/350 formalin solution for ten minutes and placed under a tarpaulin for eight hours.

The 1/350 formalin solution is made by mixing 1 lb. of commercial formalin with 35 gallons of water.

The experiment was repeated in the 1930 season.

The germination of the formalin-treated seed in both years apparently was much poorer than that of the untreated and dry-pickled seed, but very little difference could be noticed between the early stages of growth on the various plots.

When the heads were formed, it was found that the oats in the unpickled plot were heavily smutted, but traces of smut were found in all plots.

A census was taken to determine the amount of smut infection and the effect of the various treatments on germination. The method of taking this census was as follows:—

Six sets of samples were taken from each plot (9 hoes wide by 5 chains long). Each sample consisted of the total plants from 1 foot length of drill row. There were 27 samples in each set, each sample being taken 12 feet apart, and so arranged that every drill row was progressively represented. The total number of foot-long samples taken from each plot was 162.

The six sets of samples were arranged to give thorough representation of the whole plot. Each set (consisting of 27 foot lengths

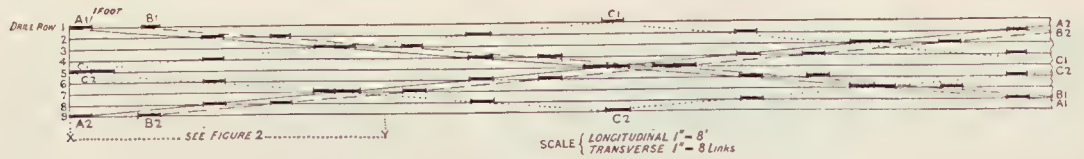


Fig. 1.

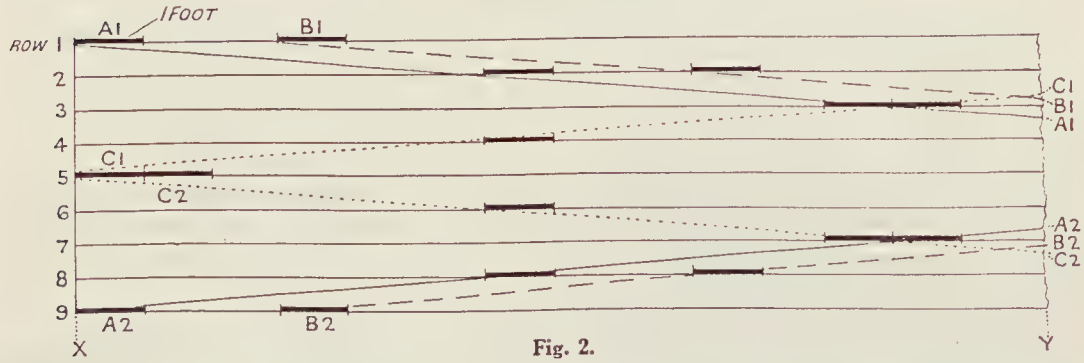


Fig. 2.

of drill row) was counted separately, and the percentage of infection obtained. The average of the six sets was taken as the percentage infection for each plot. Figure 1 shows the arrangement of samples over the whole plot.

The A1 samples were collected as follows:—The first sample consisted of 1-foot length of row taken from the end of drill-row No. 1. The second was taken a distance of 12 feet from the first sample, but on row No. 2. The third was a similar distance from the second sample, but on row No. 3, and so on. The ninth sample was on the outside row, and from here the same system was carried out, but in the opposite direction across the plot. The set A2 was taken in a similar manner, but taking the end of row No. 9 as the starting point.

In the series B1 the same procedure was adopted, the first sample being taken 6 feet away from the first sample of A1, but from the same drill row. B2 commenced 6 feet from A2 along row No. 9.

The first samples from C1 and C2 were taken from the end of row No. 5, the same method of distribution being followed.

It will be seen from the plan that certain of the sampling points were coincident, e.g., where the sets C1 and C2 commences, and where the line representing the series A1 crosses A2. In these cases it was necessary to take the sample from the foot-length of row adjoining the sample which had taken its place. Figure 2 is an enlargement of the portion X–Y on Figure 1, and shows the arrangement of the samples in the drill-rows. It illustrates also the method adopted where the sampling points were coincident.

To facilitate examination and accuracy in counting, each sample was pulled up before the counts were made. The number of plants per foot was obtained by dividing the total number of plants taken from each plot by 162, which was the number of foot-long samples taken from each plot.

A summary of the results of the census in 1929 and in 1930 is given below:—

Plot.	Treatment.	No. of plants taken.		No. of infected plants.		Percentage infection.		Average plant/ft.	
		1929.	1930.	1929.	1930.	1929.	1930.	1929.	1930.
1	Unpickled	1,026	1,388	328	436	31·96	31·4	6·33	8·57
2	Dry pickled, Cu. Carb. 2 oz./bus. ..	1,061	1,272	39	51	3·77	4·0	6·55	7·85
3	Formalin, 10 mins.	715	1,007	8	41	1·12	4·1	4·41	6·22
4	Formalin, 3 mins.	833	1,092	18	38	2·15	3·5	5·14	6·74
5	Formalin, 10 mins., 8 hrs. under tarp.	727	957	3	30	0·41	3·1	4·48	5·97

It will be noticed that the formalin gave slightly better smut control than the copper carbonate, but this advantage was more than offset by the distinct lowering of the germination due to formalin. Also, it must be remembered that the smut infection in both years was remarkably high, and its reduction by copper carbonate must be considered very satisfactory. Under normal conditions it could be expected that dry pickling would reduce the smut infection to a negligible quantity.

The counts made in 1929 were based on plant infection, i.e., any plant showing one infected head was regarded as infected. It was noticed that some plants had more infected heads than others. The actual loss in the crop is represented by the number of infected heads rather than by the number of infected plants.

In 1930, the number of infected heads per plant was counted also, so that the percentage of infected heads in each plot was obtained as shown in the following table:—

Treatment of plot.	Total plants counted.	Total heads counted	No. of heads per plant.	Percentage of infected heads on infected plants.	Percentage of infected plants.	Percentage of infected heads in plot.
1. Unpickled	1,388	3,116	2·25	75	31·4	22·8
2. Dry pickled	1,272	2,969	2·33	67	4·0	2·6
3. Formalin, 10 mins.	1,007	2,671	2·65	67	4·1	2·8
4. Formalin, 3 mins.	1,092	2,855	2·61	62	3·5	2·1
5. Formalin, 10 mins., and 8 hrs. under tarp.	957	2,595	2·71	51	3·1	1·7

It was found that the plants in the plots where the poorer germinations were obtained had stooled more freely, but not sufficiently to offset the effects of the poorer germination.

Where the plant infection was heavy, as in the unpickled plot, the percentage of infected heads per plant was greater than in the pickled plots, where the plant infection was very low. The effect of the pickle, therefore, is to reduce both the number of infected plants and the number of infected heads on the infected plants.

SUMMARY.

Experiments conducted at the Rutherglen Experiment Farm in 1929 and 1930 with Algerian oats naturally infected with oat smuts resulted in the following conclusions:—

1. It is not advisable to use seed oats which has been obtained from a crop infected with oat smuts. When clean seed is not obtainable, or the origin of the seed used is doubtful, the disease may be controlled to a great extent by pickling the seed before sowing.

2. The dry pickle, copper carbonate, used at the rate of 2 oz. per bushel of oats, provides a simple and safe method of pickling. For the reasons mentioned below, it is preferred to the wet-pickling method.

3. The percentage of plants affected by smut in the various plots was as follows:—

	Percentage of affected plants. 1929.	1930.
1. Unpickled	32.0	31.4
2. Dry pickled, copper carbonate, 2 oz. per bushel	3.8	4.0
3. Formalin dip, 1/350—10 minutes' immersion	1.1	4.1
4. Formalin dip, 1/350—3 minutes' immersion	2.1	3.5
5. Formalin dip, 1/350—10 minutes' immersion and then covered with		

4. The formalin-treated seed germinated poorly compared with the unpickled or dry-pickled seed. Oats usually are sown on a dry seed-bed before the autumn rains, and are thus subject to poor germination conditions. Hence it is advisable to avoid any treatment that would further retard germination.

5. The dry-pickled seed ran easily from the drill, whereas the formalin-treated seed was swollen and difficult to sow.

6. It is possible that, by using the dry pickle at higher rates per bushel, the oat smuts could be still more efficiently controlled. Experiments to investigate this possibility will be carried out in 1931.

A Simple Test for Sulphur Dioxide Content of Dried Apricots.

By W. R. Jewell, M.Sc., F.I.C., F.A.C.I., Agricultural Research Chemist.

THE Australian Dried Fruits Association, at its conference in November last year adopted a resolution requesting that steps be taken to ascertain whether a simple process which could be operated in a packing shed, could be evolved to test dried apricots for sulphur dioxide content. This resolution was referred to the author, who undertook to investigate the matter.

After consultation with a number of packing shed managers, it appeared that the problem would be solved if a simple test were evolved which would distinguish oversulphured apricots from those containing less than the prescribed maximum of 14 grains sulphur dioxide per lb., and investigations were carried out with this end in view.

A satisfactory method must be approximately accurate, sufficiently simple to be conducted by an intelligent member of a packing shed staff, and as rapid as possible. A direct titration by iodine solution of apricots mixed with water naturally suggests itself as complying with these requirements. A large number of samples were analysed by the official method for sulphur dioxide content, and duplicates were tested by a direct titration method, with the result that an empirical relationship was established between the latter and the actual sulphur dioxide content of the fruit.

On this basis the method given below was evolved. The method is quite simple and straightforward, and needs no amplification here. A number of bottles should be used so that several tests may be made in a short time. By running the iodine solution in from a burette, and shaking after the addition of each 1 c.c. until the blue colour persists for 15 seconds, the method can be made approximately quantitative, multiplying the number of c.c. of iodine solution by 0.78 to obtain grains of SO_2 per lb.

It would be advisable with oversulphured apricots to have the actual sulphur dioxide content determined, either by the official method or, roughly, by the modification indicated above. Apricots badly oversulphured should be treated with hydrogen peroxide solution to remove excess of sulphur dioxide (see this *Journal*, August, 1929, p. 480, for a description of the method). Those only slightly oversulphured probably could be blended with those having a low sulphur dioxide content. The latter may be distinguished if, when carrying out the test, the bottles are allowed to stand after the expiration of the fifteen seconds; those in which the blue colour takes longest to disappear are apricots lowest in sulphur dioxide.

The method described below for examining apricots is admittedly approximate, but it should constitute a useful test in packing sheds, and should be sufficiently accurate to distinguish oversulphured apricots from those complying with regulations. It should thus be of assistance in preventing the marketing of undesirable fruit. The author would be pleased to receive comments from any one giving the method a trial. There may be cases in which the method is not reliable, but no such cases were found in the large number of experiments which formed the basis of the method.

The Method.

Solutions Required—

One-tenth normal iodine solution, containing 12.7 grams iodine and 18 grams potassium iodine per litre. To be kept in brown or blue-coloured bottle.

Starch solution, prepared by adding one teaspoonful of starch to about two cups of boiling water and continuing boiling for a few minutes. To be made fresh daily.

Apparatus Required—

Stoppered bottle of 600 c.c or more capacity. A screw-stoppered lemonade bottle would do.

Measuring cylinder—25 c.c.

A balance and 2 oz. weight.

Method.—Exercise care in obtaining a representative sample, which should then be "quartered down" until about ¼ lb. remains. Pass this through a small mincer twice.

Weigh carefully 2 oz. of the minced sample and transfer to the stoppered bottle. Add 500 c.c. (say, two large cups) of water. Insert stopper and shake well every ten minutes until two hours have passed. Add about a teaspoonful of the starch solution and 18 c.c. of the iodine solution (from the measuring cylinder), and shake vigorously for *fifteen seconds.*

If at the end of this period the dark-blue colour persists, the sample contains less than 14 grains per lb. If the colour has changed to grey or apricot the sample is over-sulphured and contains more than 14 grains of sulphur dioxide per lb.

Note.—A green colour shows that too little starch solution has been added; repeat test with more starch. The iodine solution and the measuring cylinder may be obtained from suppliers of chemical apparatus.

The simple Apparatus required for the Test.

CORRECTION.

Vol. XXIX, Part 1, page 13.

Line 15, 2nd column—*for* "165 lb. of superphosphate" *read* "52·6 lb. of superphosphate".

Line 17, 2nd column—*for* "at least 82 lb." *read* "at least 26·3 lb.".

Young Farmers' Clubs

A Movement for Country Boys and Girls

By A. J. Gill, Senior Herd Tester.

THOUGH it is a trite saying that all wealth comes from the land, few of us realize how dependent we are upon the soil for the food we eat and the clothes we wear.

In Australia, with its vast spaces, we require a greater population, and the best settlers will be the sons and daughters of our own farmers. The future of the Commonwealth depends largely on the ability of its primary producers, who must have such a knowledge of their work that they will be at least equal in ability to farmers in other parts of the world.

The boys and girls of to-day will be the men and women of to-morrow; therefore, if a start could be made now in giving them instruction in their future tasks, in seven or eight years' time all our young farmers would be trained for their work.

It is, of course, impracticable to send every boy to an agricultural college. The next best thing then is for all prospective farmers to become members of a Young Farmers' Club. The object of these clubs is to interest children in country life, and to interest boys in various phases of farm work. In some places there are girls' clubs, the object of which is to instruct girls in branches of domestic work.

Clubs in Other Parts of the World.

In many parts of the world the Young Farmers' Club movement has been enthusiastically supported during the past few years. It is said that, in the United States of America, a million children are members of various clubs, the chief of which is known as the 4 H Club. Its emblem is a four-leaved clover, and on each leaf is stamped the letter H, the four letters representing Head, Hands, Heart, and Health. The pledge made by members is as follows:—"I pledge my head to clearer thinking, my heart to greater loyalty, my hands to greater service, my health to better living for my country, community, and my club." Camps are held by the Club and, at these, short courses of instruction are given, and teams take part in judging competitions. Fortnightly or monthly meetings are held; at these the first hour or so is given up to the discussion of some agricultural or farming problem; the remainder of the evening is devoted to songs, games, &c. The value of the discussions is that it helps the children in the formation of logical opinions and the clear expression of them. Besides improving agriculture and dairying methods, Clubs have created a bond of good fellowship and so strengthened the social life in those districts where they exist.

The first Young People's Club formed in the United States was a Corn (Maize) Club. Its object was to teach the members how to select good seed and the best way to cultivate the plots. The farmers of the district, seeing the good results obtained by the children, not only purchased seed from them, but imitated their methods.

There are hundreds of Stock Clubs in America, Pig and Poultry Clubs predominating, and there are two reasons for this—pigs and poultry can be kept in smaller areas than can cattle; further, there is a quicker return to be had from them. Breeders' Associations do a great deal to originate and foster the clubs. Breeders of Guernseys and Friesians will start clubs for their respective breeds. In those places where there are Pig Clubs the young boars are sold by the children; where there are Poultry Clubs the cockerels are sold to farmers in the surrounding districts. Here, again, an improvement in stock methods has its beginning in the Young People's Club.

Young People's Clubs in Victoria.

It is pleasant to state that many of these Young Farmers' Clubs have been founded in Australia, particularly in Victoria. Though yet operating only in a small way they have

had excellent results. Some years since, Mr. Griffiths started a Calf Club at Geelong. This club has prospered, and has been the means of instructing many children in the method of rearing young stock, as well as enabling some of its members to begin dairying with the makings of excellent herds.

In the Ballarat district the local Young People's Clubs have been fortunate enough to receive the support of leading business men, of the Rotary Club, of Mr. Inspector Gill of the Education Department, and of many teachers in the district. The clubs there are managed by a committee consisting of teachers and of members of the Rotary Club. The total number of clubs supervised by this committee is 23, some of which have been in existence for over three years. The teachers of the district are to be highly commended for their great enthusiasm, and one has only to visit any school with which a club is associated to see the excellent work that is being done.

The value of the stock held by the several clubs in Ballarat and the surrounding districts is estimated at approximately £2,000. One boy in this district recently received over £100 for his pure-bred calf.

The good results that attend the work of these clubs is particularly obvious at the Ballarat Orphanage, and I believe that if the boys there were asked what occupation they would like to follow, nine out of ten would say without hesitation that they wished to go on the land. One of the students at the Orphanage school was some time since chosen for the post of manager of an important pure-bred herd.

Every April a Home Projects' exhibition is held at Ballarat, and samples of cooking, fancywork, vegetables, flowers, &c., are placed on exhibition. Last year there were nearly 700 exhibits. The usual practice is for the teachers to judge the exhibits and select the two best in each section for exhibition at the local Show, where two shields are competed for annually. At the same time the children exhibit their stock and judging competitions are held, and in this task the girls are quite as good as the boys.

This year an endeavour is being made to extend the club movement, and Mr. Taylor, the Secretary, is hopeful that the number of clubs will be greatly increased. It is certainly through the country schools that the work must spread, and parents should try to assist the teachers in any way they can.

At the little school at Scotsburn the annual receipts from the garden amount to about £25. Mr. Bevan, the teacher there, has suggested that, perhaps, in some way, town children might go into partnership with country children in the rearing of stock; this would help to draw interest from the city to the country; consideration is to be given to this suggestion. One of the residents of Scotsburn has placed a plot of land at the disposal of the school children, and on this pasture experiments are being made. Similar experiments are in progress at other schools; they are an indication of the great possibilities that exist in the Young Farmers' Club movement.

At Bendigo, Mr. Tredennick, Railway Traffic Superintendent, ably assisted by Mr. Long, has been instrumental in the formation of several clubs. The first—a Poultry Club—was at Elmore, and the way in which eggs were graded for export by members has been highly commended. At California Gully a club for growing tomatoes was established, and some good crops have been raised. A local factory agreed to purchase all the tomatoes from the children's plot, but this year the children decided to donate the entire crop to the hospital. Mr. Tredennick, as he travels through the northern areas of the State, continues to promote the movement at every opportunity. Clubs have been formed in the Rochester district, and in one locality there are two clubs, one directed by the teacher and the other by his wife—the rivalry between these two clubs is very keen.

It is hoped that, with the help of Mr. Lederman, of Ballarat, a centre will be established at Warrnambool within the next few weeks. In Mr. Leslie, of Sale, the movement has a keen supporter, and from Sale, as a centre, it is believed that numerous clubs will be started in Gippsland. Already there is a Calf Club at Kardella, in South Gippsland, whose members own stock valued at some hundreds of pounds, and in the Warragul district the movement is obtaining a sure footing.

There is one essential point to be remembered when a Live Stock Club is being formed—whether Pig, Poultry, or Calf Club: it is that all stock of members must be pure-bred and pedigreed. It is of little use trying to form clubs with grade animals, for they will never raise the standard of stock. The various Stock Associations of the State will

register animals belonging to any Young People's Club, for three years, free of cost.

The question is often asked, "What sort of club do you suggest?" One's reply must depend on the situation and peculiarities of the district. Whatever sort of club be formed the organizers should try to arrange for elementary lectures by some local professional men. A talk on the Taking of Levels and on Drainage might be given by the Shire Engineer, and on Bookkeeping by a Bank Manager. In some districts a visit to a Butter Factory could be arranged, and a demonstration given on the testing of cream and milk. In those places where secondary manufactures are carried on a visit to a factory could no doubt be easily planned.

Of course, every club formed will not be successful; it is inevitable that there will be some failures. But if a teacher has the support of parents in establishing a club it will almost certainly be a success. It will be a force in the community, and may well lead to an improvement in the farming practices of the district. Some who have organized clubs for school children say that, not only have they been of use in promoting interest in their particular field, but that a noticeable improvement has followed in all the school work. Thus it may be claimed that the Young Farmers' Clubs will make better farmers, and at the same time make more studious pupils who, as they reach manhood, will make intelligent and public-spirited citizens.

Linda Knowles, member of Scotsburn Young Farmers' Club

With Her Prize-winning Ewe.

BOOKS RECEIVED.

KNOW YOUR OWN WEATHER, by D. J. Mares, F.R.M.S., Government Meteorologist, N.S.W.—A study of the factors and influences that govern the weather of the Commonwealth.

Copy from Angus and Robertson, publishers, Sydney. Price 5s.

PRINCIPLES OF FARM MECHANICS, by M. A. Sharp, M. S. and W. M. Sharp.—A book written mainly for teachers and students of farm mechanics, but contains many practical hints of value to the farmer.

Copy from Messrs. Chapman and Hall, publishers, London. Price 15s.

CROP PRODUCTION AND MANAGEMENT, by J. F. Cox, Dean of Agriculture, Michigan State College and Experimental Station.—Deals with the methods employed in crop production by the more successful farmers of U.S.A., and summarizes the results of outstanding experiments of American State and Federal Experiment Stations.

Copy from Messrs. Chapman and Hall, publishers, London. Price 13s. 6d.

Sex in Chickens and Ducklings

The Futility of Mechanical Indicators

By H. F. Clinton, Assistant Poultry Expert.

DURING my experience in the Poultry Branch of the Victorian Department of Agriculture quite a number of claims have been submitted to the Department that a means of determining the sex of the future chicken in the egg had been discovered.

In every instance where the method was discussed its futility was evident. In some cases the confidence and enthusiasm of the claimants were so marked, and appeals that the method should be given a trial were so earnest and persistent, that practical tests were actually made.

One of the first devices for determining the sex of the future chicken in the egg that caused excitement in the poultry world of Victoria, probably 25 years ago, was that known under the various names of the Sex Detector, Sex Indicator, Egg Indicator, Genderometer, &c. It is quite possible that thousands, perhaps millions, of these instruments have been sold to people of all nations throughout the world. They are usually put up in neat little containers, with full printed directions for using, and sold, generally, for about 1s. each. The instrument consists of a weighted portion to which a piece of fine cord or wire is attached, the weighted portion, according to the maker, being made of some kind of hard coloured composition, or of glass, wood, cotton-covered wire, &c. So simple does the whole contrivance appear that some people have stated that anything will do for the weighted portion—even a sewing needle would serve the purpose—and that a home-manufactured sex detector will act just as well as those that are on the market.

In the printed instructions usually supplied an illustration shows clearly the manner of using. The person making the test is instructed that there must be no conscious movement of the hand, but it should not be held rigidly. No effort must be made to resist, actuate, or control the detector; it should be entirely self-acting.

To test an egg, the instructions continue, it should be placed on a table and the detector suspended over it by the cord held between the thumb and first finger, with the elbow resting on the table. The detector should be held about a quarter of an inch above the egg. The claim is that within half a minute the detector usually begins to move; if it swings backward and forward, like the pendulum of a clock, it is an indication that the egg would produce a male bird; if the apparatus moves in a circle, it is a sign that the egg would produce a pullet; if the detector remains motionless, then the egg is infertile. It is also stated that it is interesting to make tests with the detector on birds and other animals to determine sex.

The former Chief Poultry Expert (Mr. A. Hart) carried out tests with these detectors, and the results were not in accordance with the claims made for them. They have been tested on eggs known to be infertile, and I have tested them on boiled eggs. In all cases the apparatus moved in one way or the other, indicating (according to the instructions supplied) that the egg was capable of producing a chick. These adverse experiments, together with the fact that, after all these years, the sex indicators have not come into practical use, show that this method of determining the sex of the future chicken in the egg is of no use to the poultry-keeper whatever.

Is Shape and Size of Egg any Indication?

A belief that has persisted is that the long oval-shaped egg will hatch out a cockerel and the short oval egg a pullet. At various lectures on poultry-keeping which I have attended throughout Victoria this belief has been referred to from time to time by members of the audience; but so far as I know

there have never been any definite results obtained in support of the theory.

Many claims have been made that peculiarities of the shell or of the contents of an egg indicate the sex of the chick that would be hatched from it, but the claims have never been substantiated.

A large egg may produce either a male or female chick, and the same may be said of small eggs. Crew (1925) states:—

> "In the case of the dove and the pigeon, Riddle finds that those eggs which yield females are larger and contain more food material for the embyro than those which become males. The size difference is small, however, and the 'large' eggs and the 'small' eggs vary in size; there is overlapping of the curves when the size is plotted in a graph, and for this reason it is impossible to predict, from the size of the egg alone, the sex of the future bird."

The Determination of Sex.

It is now established that, in the higher animals at least, the sex of the individual is decided at the time of fertilization.

In mammals and in most insects the male produces two kinds of sperm differing in their chromosomes, one kind capable of producing a male and another kind that will produce a female. But in the female all the eggs are alike in regard to their chromosomes, and therefore have no influence on the sex of the future embryo. The resulting sex in these animals is therefore dependent upon the particular kind of male sperm that enters the egg at the time of fertilization. In birds, butterflies, and moths the position is reversed, the female producing two kinds of eggs, differing in their chromosomes, and the male one kind of sperm. So that in the domestic fowl it is the egg that determines the sex of the future chick, some of the eggs having the male determining factor and some the female determiner.

Theoretically one should then be able to tell the sex of the future chicken by means of a microscopical examination of the chromosomes in the fertilized egg. Practically, however, this is not to be seriously considered, as in order to do this, of course, it would mean the destruction of the egg.

With reference to the embryology of the chick, Marshall (1893) states:—

> "During the eighteenth century, facts accumulated rapidly, but the theories quite outpaced them; and the current doctrine throughout the century, supported by many, and, notably, by Haller, was that of preformation, according to which the chick was stated to be present in the egg at the time it is laid, all its parts and organs being there from the beginning, but in an extremely minute and unexpanded condition, the development of the embryo being regarded as a process comparable to the unfolding and enlargement of the several parts of a bud to form the perfect flower."

But with the development of the study of embryology and microscopical research it was found that the first conspicuous structural feature to make its appearance in the embyro after the laying of the egg and during incubation is the primitive streak. In eggs that have been incubated about 16 hours the primitive streak, as seen under the microscope, is well developed as a linear groove flaked on either side by ridge thickening; it is during the following days of incubation that the embyro gradually takes form. By careful dissection, it is found that it is not until the fifth and sometimes the sixth day of incubation that the first indications of the sexual organs become recognizable.

Attempts to Control Sex.

Attempts have been made to control the sex by methods of feeding, special matings, &c. In practice on a large commercial scale, these tests have broken down. It certainly would be a great help to the poultry-keeper to be able to control the sex. With eggs as the chief object on farms where White Leghorns are kept, the females are the birds required. The sex of chicks of this breed cannot be unfailingly determined by any casual examination until the birds are about five or six weeks old.

Thousands of cockerels are sold at the auction rooms in Melbourne every year during the months of September, October, and November, as soon as possible after the sex can be distinguished. A prominent poultry auctioneer states that during last season he sold 31,000 cockerels from one farm. Some poultry-keepers top off their cockerels

and sell them when they are from ten to twelve weeks old, and generally receive good prices; but many consider that the work is hardly worth while, and dispose of the cockerels as soon as possible.

It is the opinion of many poultry-keepers that the proportions of sexes in poultry are nearly equal. The sex ratio is influenced by a great many factors. It is well known that sometimes there is an excess of males and at other times an excess of females. Pearl (1917) recorded the sexes of 20,037 chickens, produced from families of ten and over, and found the proportions to be 944 males to 1,000 females.

Distinguishing the Sex of Chickens.

For many years some investigators have concentrated on an endeavour to find a practical method of distinguishing the sex of chickens at the time of hatching. A great deal of success has been achieved in this direction by a method known as sex-linkage. If a Rhode Island Red cock is mated to a Light Sussex hen, the sex of the chickens so bred can be determined immediately after hatching. The male chicks will be white or yellow, and the females a warm buff or brown. Quite a number of crosses may be made with different breeds, but the White Leghorn, unfortunately, has not yet lent itself readily to advantage in respect to sex-linkage. In a recent report by Professor Punnett he states that—

> "The most recent development of work at Cambridge has been the extension of sex-linkage to a true-breeding race. In this new race, the 'Cambars,' are characterized by perfectly distinct downs. There is no need of crossing for the production of a sex-linked result. The 'Cambar' is a light breed in which the sexes automatically declare themselves at hatching. When worked up for egg production it should help to solve the problem of unwanted cockerels in light-laying breeds."

In an article by Helen M. Molyneux, N.D.P., in the *Feathered World*, London, of the 3rd January, 1930, the following interesting references are made in regard to further work on sex determination at hatching:—

> "Sexing chicks at a day old by means of sex-linkage is not used as extensively as it might be, probably because it means crossing two breeds or two varieties and the keeping of these two distinct parent breeds. What is really required is a method of determining the sex of chicks at or near hatching time, which must be accurate, simple, rapid, and non-injurious, so that any kind of pullet, pure bred or otherwise, could be definitely picked out when a day or so old."

Such a system of sex determination was reported by Japanese representatives at the World's Poultry Congress in 1927. It depends upon the presence of a rudimentary sexual organ in the vent of the male bird. This method of determination is similar to that used by Dr. te Hennepe to sex ducklings. It has been tested both with chicks and ducklings at the National Institute of Poultry Husbandry, England, last year. The chicks from sex-linked crosses were used as a means of identifying the sexual organs in the day-old chicks, and 50 White Leghorn chicks were used as a test on the accuracy of the method with the following results:—

Results of Sexing 50 White Leghorn Chicks Hatched 27th April, 1929.

Examined.	4th May.	6th May.	11th May.
Age.	7 days.	9 days.	14 days.
Percentage accurate ..	63·34	77·8	66·7
Cockerel Error*	13·33	11·1	Nil
Pullet Error†	23·33	11·1	33·3

* Cockerel error refers to the sexing of a male chick as a pullet.
† Pullet error refers to the sexing of a female chick as a cockerel.

The conclusions from the experiment with chicks were set out as follows:—

> "1. That under the conditions of the experiment, sexing young chicks by means of the presence or absence of the rudimentary male sexual organ is not sufficiently accurate to be of economic importance to the industry, because—
>
> (*a*) it allows far too great a pullet error;
>
> (*b*) it takes far too long;
>
> (*c*) it is a difficult and complicated method to learn.
>
> 2. That there is a difference in the physiological structure and appearance of the male and female vent.

3. That the difference is not always apparent in very young chicks, but may sometimes be described as definite.
4. That the difference is easily discernible as sexual maturity approaches, and is quite apparent by six weeks in light-bred cockerels.
5. That the rudimentary male sexual organ is larger in light breeds than in heavies.
6. That no such organ is to be discovered in capons.
7. That further investigations with chicks might lead to possibly interesting discoveries."

From all the facts known at the present time, it would seem that only by sex-linkage can chicks be produced whose sex can be determined with certainty at the time of hatching.

Commenting on experiments made with ducklings, the *Feathered World* says—

"The Japanese method closely resembles Dr. te Hennepe's method of sexing ducks. Partly with a view to increasing the knowledge available on the sexing of ducklings, but mainly as a source of further information on the Japanese method, all of the ducklings hatched at the National Institute of Poultry Husbandry during 1929 were examined for sex.

There was no difficulty at all in sexing the ducklings. The drakes in the first hatch were all given a coloured legband as a means of identifying later for sex. Subsequent handling has proved these to be 100 per cent. accurate. All of the later hatched ducklings at the Institute, well over 300, were sexed, both at one day old and at three to four days old, the age making no significant difference, and the drakes disposed of immediately. The great point about this method is that, although you may keep one or two drakes, you cannot possibly throw out a duck."

The conclusion of the test is stated as follows:—

"That sexing day-old ducklings by means of the presence or absence of the male copulatory organ is a simple, rapid, and accurate method."

Ainsbury Crop and Fallow Competition.

In his report on the Ainsbury Crop and Fallow Competition, the judge, Mr. W. J. B. McDonald, B.Agr.Sc., points out that in common with many Mallee settlers, farmers in this district, during the last few years, have been forced to depart from what they know to be the soundest agricultural practice. As lean year has succeeded lean year, each farmer has continually increased the area under crop with the hope of netting a big cash return with the first good season. The result this year is that there is but a very limited area of fallow available for next year's crop.

It is generally conceded that sheep must be carried if farming is to yield its maximum return in the Mallee. Owing to its proximity to Swan Hill, one of the best sheep markets in the State, the Ainsbury district seems admirably suited to a rotation system that would allow fullest advantage to be taken of its sheep carrying capacity. Owing to the liability to drift it is a mistake to work fallows to too fine a condition. Sheep would be an invaluable asset in helping to consolidate the seed-bed and controlling weed growth without excessive cultivation.

A little more initiative in at least trying out a few oat varieties should prove a definite advantage to the district. Algerian is too late in maturing. Mulga is a much earlier oat that, in several instances round Ultima, a closely related district, is very favorably commented on. Sunrise gives good palatable early feed, and matures much earlier than does Algerian, but goes down under windy conditions. Mulga, Sunrise, Gidgee, and Belar are varieties that should be worth trying.

It seems imperative that this district should revert to a system of farming that will provide a sound rotational system. This reversion should be accelerated by the low price of wheat, as oats and sheep will naturally represent a greater proportion of the grower's net return. This year oats have been a profitable crop to the grower, as, in many instances, they have carried practically all his stock up to the beginning of October, and have then, after the October rains, cut a reasonable quantity of hay.

Orchard and Garden Notes

By Edward E. Pescott, F.L.S.

The Orchard.

THE question regularly arises as to whether manure should be applied to orchard trees in spring or autumn. H. N. Wicks has shown recently, in South Australia, that apple trees received an excellent stimulus as a result of autumn manuring with a nitrogenous fertilizer, and that, following on a dressing of 3 cwt. per acre of sulphate of ammonia, the young apple trees in his nursery put on a phenomenal young root growth, which had grown fully 7 inches in five weeks.

This nurseryman points out that it is usual to supply nitrogenous fertilizers in the spring, such manuring being helpful to the fruit as regards size and colour as well as stimulating the tree. But it is possible that one application of manure is insufficient, and that an additional dressing in autumn would further benefit the trees.

Florence Vaughan—A free-flowering Canna.

This autumn application may help to solve the problem of the "off" year, particularly in apples, and it is suggested that such a manuring may be helpful in securing an additional crop in the next season, especially where trees are biennial croppers.

That it pays to manure citrus trees in autumn is well proven. I have seen where the produce of a tree of Eureka lemon has been almost doubled by an autumnal application of from one to two pounds (according to size of tree) of sulphate of ammonia.

The Flower Garden.

Because of moist weather that has prevailed during the summer months, rose bushes are suffering more this season than has been the case for many years previous. Mildew is very bad in all districts. As this fungus attacks the young growing shoots, much loss of bloom follows an attack. As soon as the grey powdery appearance (which is the mildew fungus) is noticed, the bushes should be well dusted with sulphur, which should be sifted through a piece of hessian. This work is best done in early morning when the bushes are wet. If the foliage is dry, it should be sprinkled with water before sulphur dusting.

The disease known as "die-back" is becoming very common. It appears first in the young shoot, the tip browning and then dying, and death extending down into the old wood. Quite frequently the bushes die. The disease is supposed to be due to a "virus," and no definite remedy is yet known.

When the bushes are attacked, the diseased parts should be cut back and burned, and the secateurs afterwards should be sterilized by dipping in boiling water. The bushes then should be heavily watered; and after the watering, 1 oz. each of lime and permanganate of potash should be worked into the soil around each bush. These are not definitely curative methods, but they help the bushes to recover and, in a measure, to resist the disease.

One of the hardiest groups of plants is the Canna, and for freedom of flowering and brilliance of colours, it is difficult to surpass. For months in summer time the cannas give a succession of bloom, under very hardy conditions. Just now, the Cannas should be at their best. They revel in a good soil, and if water be available, they make a splendid response. As the old stems have finished flowering, they should be cut right down, to make room for new growths and blooms.

It is now the season to sow seeds of winter and other hardy-growing annuals. Such seeds as iceland poppy, pansy, carnation, verbena, mignonette, cineraria, sweet pea, antirrhinum,

aquilegia, primula, stock, and viola are among this group. The seeds should be sown in a light sandy soil; they should be protected from the hot sun by powdered leaf mould or by newspaper covers, and the surface soil must not be allowed to become dry. The seeds are always within the top inch of soil, and if this inch dries out the germinating seeds quickly wither.

Beds and plants of lily of the valley, azalea, and rhododendron should be mulched with leaf mould or old animal manure. They may be given also a sprinkling of bonedust, and as well they must have ample water in the summer and autumn.

The Kitchen Garden.

Seeds of beet, cabbage, sprouts, cauliflower, parsnip, carrot, turnip, lettuce, and radish may now be sown. Cabbage, sprouts, and cauliflower should be sown in seed beds for later transplanting; the others may be sown in rows, in the beds where the crops are to be grown. In the case of the former seeds the soil of the seed-bed should not be rich, and it should be quite light or sandy. In raising these seedlings, they should be grown under hard conditions, so that they will not be soft nor overdrawn. Later on, when set out in the beds, they may have rich soil and abundant water to stimulate a good growth.

Beet, parsnip, carrot, turnip, and lettuce seed should be sown thinly in the rows where they are to remain. Prior to sowing, the soil should have been well worked and made friable. As the young plants grow, they should be thinned out, leaving a few inches between each plant for proper development.

Any lettuce seedlings so thinned out may be transplanted into another bed for a later crop. Lettuces do best in a very rich soil, and in summer time they should have almost a superabundance of water. Among other vegetables it is hardly possible to overwater, provided the soil drainage be good, are rhubarb, asparagus, tomatoes, marrows, pumpkins, and similar plants.

Plums for Export.

In a memorandum on the requirements necessary for the successful shipment of plums overseas, the Cool Storage Research Officer, Mr. G. B. Tindale, B.Agr.Sc., states that, so far as variety is concerned, the later-maturing plums have the longest storage life, and these should be exported in preference to the early-maturing varieties. The degree of maturity at picking time is important. The plums should be picked when they are just showing the first signs of softening. If picked immature, they will not develop any quality.

It is most essential that the plums be sent to the cool chamber as soon as possible after picking, and he recommends cooling of the fruit before packing. The plums could be first cooled to about 40 deg., packed at that temperature, and then transferred to a chamber at 31 deg.; or they could be cooled to 31 deg. after picking, packed at normal temperatures, and then transferred again to 31 deg. The disadvantage of the latter method is that the plums get wet during packing, due to moisture depositing on the cold fruit. The plums should be held at 31 deg. until shipment can be arranged. They should be transferred from the cool store to the ship in an insulated truck and carried overseas at a temperature of 31 deg.

So far as temperature is concerned, it is most important that the plums be kept at a temperature of 31 deg., and that they should be reduced to this temperature as soon as possible after picking. Delay in reducing the temperature or holding the plums at a higher temperature will cause them to ripen, with the result that they would probably arrive overseas in an over-ripe condition.

Professional Papers

[This section is devoted to professional papers and articles of a scientific character.]

Blue and Green Moulds of Oranges

Sources and Methods of Infection, together with a Study of Temperature in relation to Infection Periods

By G. B. Tindale, B.Agr.Sc., and S. Fish, M.Agr.Sc., Plant Research Laboratory.

ONE of the most pressing problems of the citrus industry is the prevention of mould development in citrus fruits. In practice, a considerable time elapses between the picking of the fruit and its consumption. This fruit, after picking, is taken generally to the local packing shed, where it is graded and packed ready for transport to market. It frequently happens that although the fruit appears perfectly sound at the time it is packed, it reaches the market in a mouldy condition. On other occasions consignments may develop mould after a period in cool store or during export. It is well known that an injury of some description, if not essential, is almost invariably precedent to infection by common blue and green moulds. The spores which alight on these injuries may germinate and produce germ tubes which ramify throughout the fruit, causing the mouldy condition. The period from the time the spores alight in the injury until the first sign of the mould (known as the infection period) varies considerably with temperature. With a view to obtaining evidence which might lead to control, an investigation was initiated, and a progress report is given below.

This work included an examination of the sources and methods of infection of blue and green moulds, together with a study of the effect of temperature on the infection period.

An examination was made to see at what stage during the handling of the fruit it was likely to be contaminated with spores of blue and green mould, and it was found that the spores mostly occurred on the grader and in the packing shed.

Work in relation to the methods of spread of blue and green moulds from fruit to fruit showed that both moulds could spread to a sound orange by contact. In the past it was thought that blue mould only could do this, and for this reason it was generally referred to as blue contact mould.

The logical sequence of the work was then a study of the effect of temperature in the development of the disease. This period was much longer at lower temperatures than at temperatures nearer the optimum. For example, at 78 deg. F. the period was three days, whereas at 38 deg. F. it was 28 days. At the higher temperatures a point was reached where the moulds would not develop, although the oranges were transferred back to the most favorable temperature; as the result of this work it was seen that the holding of susceptible lines of oranges for three days at 94 deg. F. offers a means of largely overcoming the problem of blue and green mould in citrus fruits.

Examination of the Sources of Infection.

The method adopted was somewhat similar to that used by M. R. H. Thompson[1], which consisted of exposing for five seconds to the atmosphere to be tested, sterile potato dextrose agar in 4-inch Petri dishes. After exposure the Petri dishes were placed in an incubator at 67 deg. F., and the colonies of blue and green moulds which developed were counted.

Location of Exposed Petri Dishes.	Number of Petri Dishes Exposed.	Total Number of Colonies of Blue Mould.	Total Number of Colonies of Green Mould.
Orchard (five orchards examined)	36	1	3
Packing shed (three sheds examined)	11	6	4
Dust from graders in packing shed (three graders examined)	3	4	4
Louvre railway trucks (two trucks examined) ..	6	..	..

The results show that when the examination was made the principal sources of infection were the atmosphere of the packing shed and the dust from the graders.

Methods of Infection.

Preliminary experiments showed that where the rind of an orange was injured slightly and spores of green or blue mould brushed in, the orange invariably went mouldy. However, where an injury was made and spores not added, or where spores were brushed on without an injury, the oranges did not develop mould. In practice the chance of spores gaining an entry to an injury would be very great, especially if oranges pass through a packing shed contaminated with spores of these moulds.

Method of Spread of Blue and Green Mould from Orange to Orange.

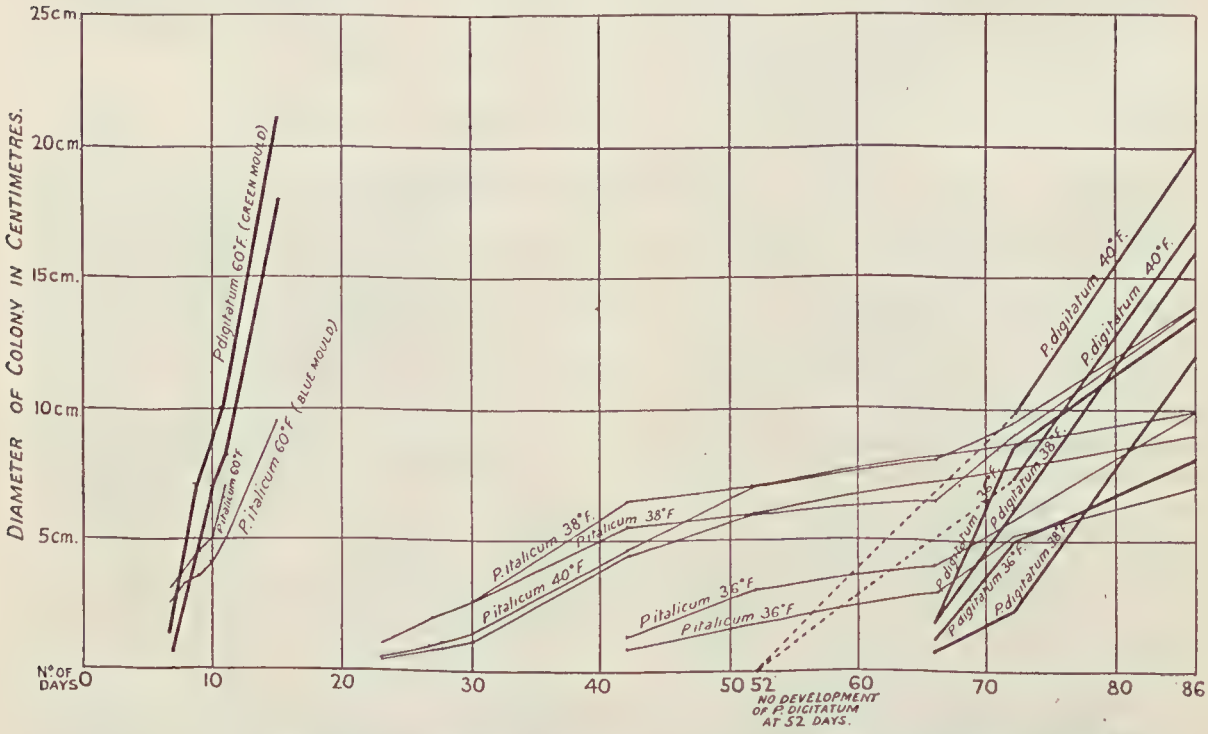
Eight oranges were taken, and half were inoculated with spores of green mould, and the remainder were inoculated with spores of blue mould. A sound orange was placed against each of the inoculated oranges so that contact was made at the point of inoculation. All oranges were then held under favorable conditions for mould development.

After twelve days not only had every inoculated orange become mouldy, but the mould had spread and penetrated each adjacent sound orange at the point of contact. It was observed that infection of the sound oranges at the point of contact took place by means of the spread of the white mycelial growth which had developed on the inoculated oranges. This applied to both blue and green moulds.

Further experiments showed that sound oranges placed against a mass of spores on a mouldy orange (not against a white mycelial growth) did not go mouldy.

The Influence of Temperature on the Period of Infection and Rate of Development of Blue and Green Moulds in Oranges.

Twelve navel oranges were inoculated midway between the stem and stylar ends with a spore suspension of blue mould and an equal number were similarly inoculated with a spore suspension of green mould. The in-



Graph No. 1.—The effect of temperature on the infection periods and rates of development of Blue and Green Moulds in Navel Oranges.

jury in each case was made 1 mm. deep, and the oranges placed in beakers over a free water surface, and held at the following temperatures:—32 deg. F., 34 deg. F., 36 deg. F., 38 deg. F., 40 deg. F., 60 deg. F. The relative humidity at all temperatures was maintained not lower than 94 per cent.

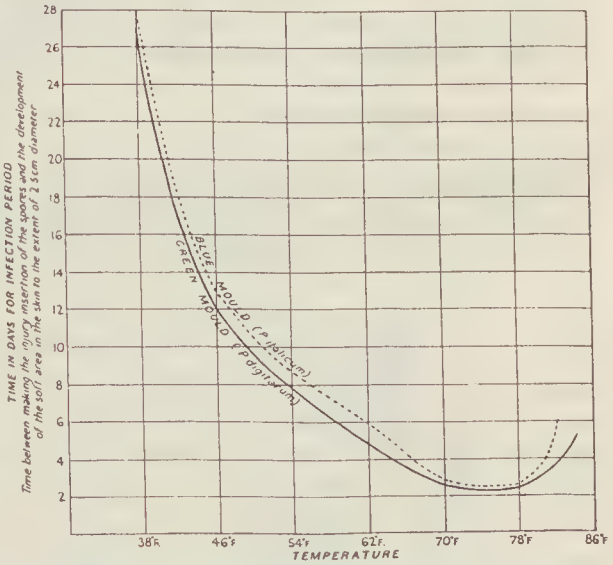
The infection period, i.e., the time from inoculation until the first macroscopic sign of the disease, was noted and the diameters of the colonies which developed were measured from time to time. The results are given in graph No. 1. This graph shows that at 60 deg. F. the infection periods of both the green and blue moulds were less than seven days, and although the blue mould had apparently been the first to appear, yet the green mould ultimately outgrew it.

At 40 deg. F. the infection period for the blue mould was 23 days and at least 50 days for the green mould. At 38 deg. F. the infection period for the blue mould was 23 days and 66 days in the case of the green mould. At 36 deg. F. the infection period for the blue was 42 days and 66 days in the case of the green mould. At 32 deg. F. and 34 deg. F. no development took place up to 86 days, when the experiment was discontinued.

The growth rate of the green mould when it appeared was faster at 40 deg., 38 deg., and 36 deg. F. than the growth rate of the blue mould at those temperatures, whereas at 60 deg. F. the difference was not nearly so marked.

The above data support the view held by Fawcett and Barger[2] that the difference between the rates of growth of blue and green mould in oranges is greater at lower temperatures. The above shows that at low temperatures there is a longer infection period with green mould than there is with blue mould. Infections which are initiated when the fruit is in cool store behave as shown in graph No. 1. This explains a commonly observed fact with cool-stored oranges, in that blue mould is more serious during the early stages of storage life, while green mould is more serious during the later stages.

Further temperature studies were made this season in order to determine the infection period over a wide range of temperature conditions. A cut 6 mm. deep was made in the skin of a navel orange, and mould spores were brushed into the cut. Two series were included in the experiment—those inoculated with the blue mould spores and those inoculated with the green mould spores. The inoculated oranges were then placed over a free water surface and held at constant temperatures—38 deg. F., 46 deg. F., 54 deg. F., 62 deg. F., 70 deg. F., 78 deg. F., 86 deg. F., and 94 deg. F. At each temperature there were ten inoculations of green mould and ten of blue mould. The infection period was taken as the time from inoculation until the colony had reached the diameter of 2.5 cm. The results are shown in graph No. 2. It will be seen that the differences between the



Graph No. 2.—Showing the influence of temperature on the infection periods of Blue and Green Moulds in Navel Oranges.

infection periods of blue and green moulds at temperatures far removed from the optimum are not marked as in graph No. 1; this may probably be accounted for by the fact that in the second experiment the inoculations were deeper than in the first experiment. The results expressed in graph No. 2 show that at 70 deg. F. and 78 deg. F. the infection period is very short for both moulds, i.e., about three days.

As the temperature is reduced this period is progressively increased until at 38 deg. it is 28 days. At a temperature of 86 deg. F. the oranges inoculated with blue mould did not go mouldy, but some did when inoculated with

green mould, though the growth was very restricted.

After a fortnight at 94 deg. F. none of the oranges went mouldy even when transferred back to the optimum temperature of 78 deg. F.

Work was then carried out to determine the minimum length of time at 94 deg. necessary to prevent the development of mould in oranges inoculated with the spores of green or blue mould. The oranges were inoculated with the spores of blue or green mould, and held for one day at a temperature of 78 deg. F. to enable the spores to germinate and rapidly develop. The oranges were then held at 94 deg. F. for varying periods of time, and finally transferred to 78 deg. F. to enable the moulds to grow, should they have merely been held in check at the higher temperature.

Two types of inoculations were made—one in which the injury was 1.5 mm. (termed shallow inoculation) and the other in which the injury was deep enough (9 mm.) to penetrate the flesh of the orange. Where the inoculations were shallow it was found that two days at 94 deg. were sufficient to prevent 80 per cent. of the inoculations from taking. Three days at 94 deg. prevented 90 per cent. from taking. Five days at 94 deg. were necessary to prevent all shallow inoculations from taking. Where the inoculations were deep, it was found that seven days were necessary to prevent all inoculations from taking. Thus the time factor is probably related to the depth of injury and the thickness of the skin. It was found, however, that the oranges could not stand more than four days at the temperature of 94 deg. Kept beyond this period they developed a bitter flavour.

In actual practice the type of injury received by an orange during the ordinary methods of handling must be very shallow, and it is suggested, as a result of these experiments, that holding susceptible lines of oranges for three days at a temperature of 94 deg. F. offers a means of largely preventing the otherwise subsequent development of green or blue mould.

SUMMARY.

1. An examination of the sources of infection of blue and green mould spores showed that at the time of examination the atmosphere of the packing shed and the dust on the grader were the important sources of infection.

2. It has been shown that both blue and green moulds of citrus may spread to sound fruit by contact.

3. Temperature studies on the infection periods and rate of development of blue and green moulds at low temperatures showed that where shallow inoculations were made, the infection periods of blue mould were shorter than the infection periods of green mould, but when once the green mould appeared it grew faster than the blue mould.

4. A second series of temperature studies with deep inoculations did not show the same differences in the infection periods.

5. It was shown that a temperature between 70 deg.–78 deg. F. is the optimum temperature for infection.

6. It was shown that oranges inoculated with blue and green moulds, and held for one day at a temperature of 78 deg. F., and then placed at 94 deg. F., behaved, in the case of those with the shallow inoculation, as follows:—

Two days at 94 deg. F. prevented 80 per cent. of inoculation from taking place.

Three days at 94 deg. F. prevented 90 per cent. of inoculation from taking place.

Five days at 94 deg. F. prevented 100 per cent. of inoculation from taking place.

Where the inoculations were deep, it was found that seven days at 94 deg. F. were necessary to prevent all the inoculations from taking place.

7. It was also shown that oranges will not stand a temperature of 94 deg. F. for more than four days without developing a bitter flavour.

8. It is suggested as a result of these experiments that the blue and green mould development in oranges may be largely overcome by holding susceptible lines for three days at 94 deg. F.

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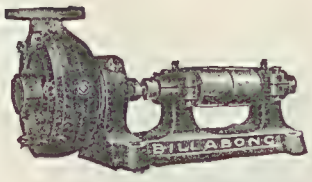

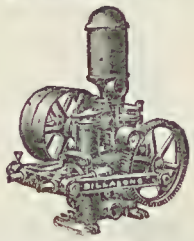

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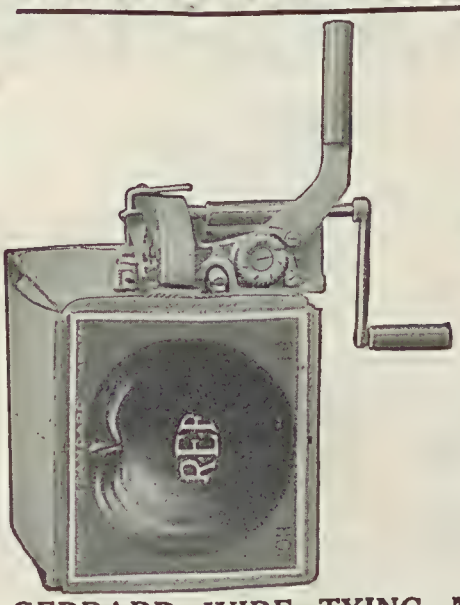

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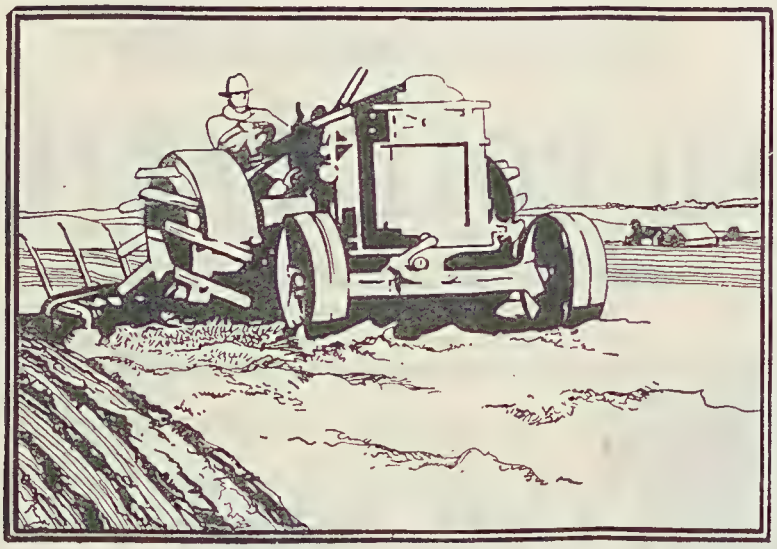

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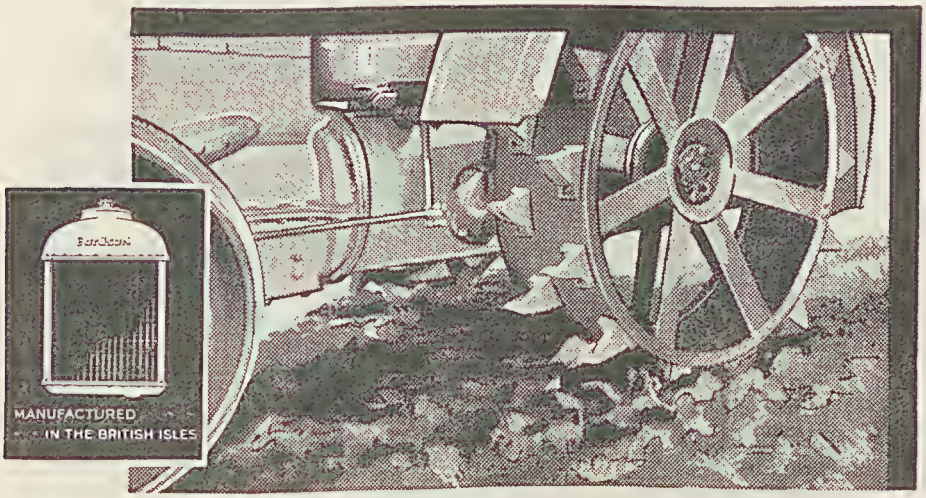

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